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**The Expedition of the Research Vessel "Sonne"
to the Mozambique Ridge in 2014 (SO232)**

**Edited by
Gabriele Uenzelmann-Neben
with contributions of the participants**



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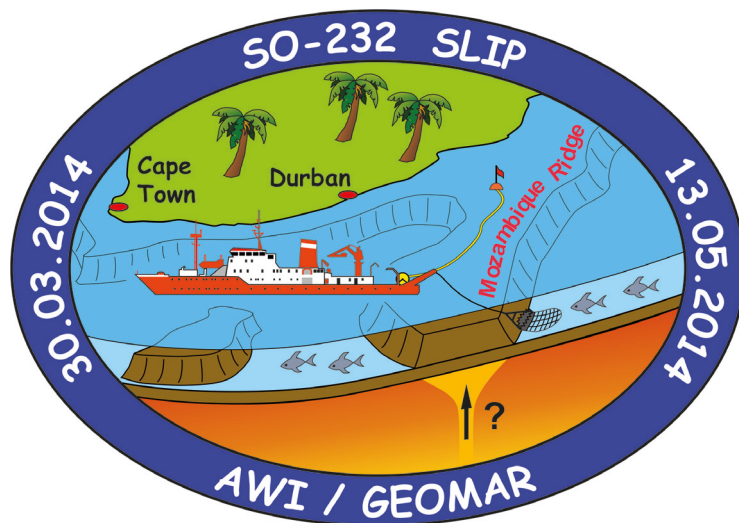
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SO232

30 March - 13 May 2014

Durban – Cape Town

**Chief Scientist
Gabriele Uenzelmann-Neben**



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1. ZUSAMMENFASSUNG/SUMMARY

Gabriele Uenzelmann-Neben¹

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Die Expedition SO232 mit *FS Sonne* vom 30.3.14 Durban, Südafrika bis 13.5.14 Kapstadt, Südafrika bestand aus reflexionsseismischen Profil- und petrologischen Dredgearbeiten im Gebiet des Mozambique Rückens, einer Large Igneous Province im südwestlichen Indik. Der Mozambique Rücken besteht aus vier geomorphologischen Einheiten, den Segmenten 1-4, die sich ebenfalls in magnetischen Daten widerspiegeln. Das Ziel der Expedition bestand in der Klärung der Rolle des Mozambique Rückens im Gondwanaaufbruch und sein direkter und indirekter Einfluss auf Klima und Ozeanzirkulation. Ein Gitter reflexionsseismischer Daten wird Auskunft über die Basementstruktur des Rückens, seine weitere Entwicklung nach der initialen Bildungsphase sowie die Sedimentverteilung und Sedimentationsumgebung geben. Petrologische Proben, welche über Kettensackdredgen gewonnen wurden, geben Auskunft über Zusammensetzung und Alter des Hartgesteins. Insgesamt wurden ~4.200 km an hoch auflösenden reflexionsseismischen Daten gewonnen. Bathymetrische Daten wurden parallel zu den seismischen Arbeiten gesammelt. Beide Datensätze wurden u. a. zur Auswahl geeigneter Lokationen für die petrologische Beprobungen während der Expedition herangezogen. Insgesamt wurden 59 Dredgezüge durchgeführt und so das Basement beprobt.

Cruise Leg SO232 with *RV Sonne*, leaving Durban, South Africa on 30.3.14, returning to Cape Town, South Africa on 13.5.14, comprised seismic reflection and petrological studies of the Mozambique Ridge, a Large Igneous Province (LIP) in the south western Indian Ocean. The Mozambique Ridge consists of four major geomorphological units: Segments 1 to 4. The major goal of the expedition was the role of the Mozambique Ridge within the break-up of Gondwana and its direct and indirect influence on climate and oceanic circulation.

Seismic reflection data were gathered to study the basement structure of the ridge, its development after the initial formation as well as the distribution of sedimentary sequences and depositional environment. Petrological dredge samples will provide information on composition and age of the Mozambique Ridge. In total ~4,200 km of high resolution seismic reflection data were recorded. Bathymetric data were recorded parallel to the seismic profiling. In addition, both data sets had been used to pick significant locations for the petrological sampling. 59 dredges were taken to sample the basement.



Fig. 1.1: Scientific crew of cruise SO232

2. OBJECTIVES

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Reinhard Werner²

¹Alfred-Wegener-Institut
²GEOMAR

Understanding the origin of oceanic plateaux and ridges has strong implications on understanding the development of the oceanic circulation, since these structures form barriers for the flow of deep and bottom water masses as well as surface currents. The inter-ocean exchange of heat and salt around South Africa maintains the global thermohaline circulation. Modifications in this interface Atlantic-Indian Ocean hence also change the global oceanic circulation. Plate tectonic movements open or close gateways such as the one between Africa and Madagascar and in this way redirect the flow paths of currents. Volcanic extrusions lead to the formation of obstacles, e.g. the Agulhas Plateau within the path ways of the oceanic currents.

The detailed reconstruction of the Gondwana break-up, the accompanying forces occurring processes as well detailed effects on the development of the oceanic circulation and climate has formed a focus of the *Geophysics* section at AWI. The large-scale plate tectonic evolution since the break-up of Gondwana and its general implications on current systems such as the Antarctic Circumpolar Current (ACC) has been largely understood. The role of the smaller fragments such as Agulhas Plateau (AP), Maud Rise (MR), Mozambique Ridge (MozR), Astrid Ridge (AR), Madagascar Ridge (MadR), and Gunnerus Ridge (GR) and their effect on the circulation flow paths and intensities are still under heavy debate (Fig. 2.1). Their sizes and locations have a strong influence the path ways of e.g. the Agulhas Current (AC) and North Atlantic Deepwater (NADW), and thus the exchange of heat between the two oceans, which is a prerequisite for the maintenance of the global conveyor belt. A reconstruction of the magmatic events and the sedimentary depositional history in the area of the southwestern Indian Ocean will provide information on the geodynamic and oceanographic-climatic development of this important gateway.

Three theories interpret the formation and development of the Mozambique Ridge and the surrounding basins totally differently (continental fragment vs independent microplate vs Large Igneous Province (LIP)), which has an effect on (a) the understanding of the extent of the Cretaceous magmatism in this region and the accompanying processes, (b) the opening of the gateway south of Africa, and (c) the evolution of the circulation system in relation to the sea floor topography. In order to better understand both the magmatic and sedimentary development of the Mozambique Ridge during the Cainozoic and its importance for the development of the circulation southeast of Africa, the sedimentary structures and magmatic deposits have been studied via a combined seismic reflection and dredge program. The following questions shall be answered, which are closely related to each other:

1. How can the magmatic rocks of the southern Mozambique Ridge be characterised? A systematic sampling carried out on the southern Mozambique Ridge will provide information on ages (133-125 Ma or

- younger?) and on the geochemical composition (e.g. ocean island basalt (OIB) or mid ocean ridge basalt (MORB) or a mixture of both) to distinguish between the models.
2. An additional phase of excessive magmatism has been observed for the separation process AP- MR (Uenzelmann-Neben *et al.*, 1999). This is documented by up to 15 km long lava flow structures, which form an at least 2.5 km thick sequence (Gohl and Uenzelmann-Neben, 2001). Can we find indications for a similar magmatism having characterised the separation of the Mozambique Ridge from its conjugate crustal block, the AR? Which extent can be identified for this magmatism? Do the magmatic rocks show a geochemical signature comparable to other Gondwana flood basalts (e.g. Etendeka), which would lead to the conclusion that the Mozambique Ridge represents a LIP as well?
 3. Leitchenkov *et al.* (2008) postulated a formation of the northern AR during the early spreading between Antarctica and Africa at 160 Ma. This is supported by König and Jokat (2010) and Gohl *et al.* (2011). Results of the BMBF project AISTEK-I already show southward inclined reflections within the upper basement on the southern Mozambique Ridge (Fig. 2.2) (Uenzelmann-Neben *et al.*, 2011), which have been interpreted as the result of excessive magmatism. This observation was based on a single seismic line and needed to be quantified.
 4. Results of the BMBF project AISTEK-I point towards a reorganisation of the current pathways in the Transkei Basin at the Miocene/Pliocene boundary. A pre-Pliocene E-W oriented sediment drift was then covered by a N-S oriented drift (Schlüter and Uenzelmann-Neben, 2007, Schlüter and Uenzelmann-Neben, 2008b). Ben Avraham *et al.* (1994) presented similar observations for the Natal Valley. There, a geostrophic current parallel to the southeast-African continental margin led to the formation of the Oribi Drift during the Oligocene (Niemi *et al.*, 2000), which was relocated towards the south during the Miocene. A tectonic rise of the Mozambique Ridge has been postulated as the origin of this relocation of the Oribi Drift (Ben Avraham *et al.*, 1994). This hypothesis shall be tested via collecting high-resolution seismic reflection data from the Mozambique Ridge into the Natal Valley.
 5. The initially planned pre-site survey for IODP proposal 702 'SAFARI' was not carried out because that proposal has already been scheduled to be drilled in fiscal year 16. Instead, we used the opportunity to collect necessary pre-site survey data for IODP proposal 834 (Uenzelmann-Neben *et al.*, 2013).
 6. An additional important aspect of the magmatic-geochemical studies is the question regarding the origin of the, relative to Atlantic and Pacific MORB, geochemically enriched signatures of Indian MORB (Indian Mantle Domain, e.g. Dupré and Allègre, 1983) and the so called Dupal anomaly (Hart, 1984), which extends as an up to 60° wide band around the Southern Hemisphere and shows geochemically strongly enriched signatures in intraplate volcanics. Those signatures are supposed to result from fragments of continental crust, which have reached the upper mantle during the break-up of Gondwana (Escrig *et al.*, 2004, Hanan *et al.*, 2004). We intend to test whether the Mozambique Ridge represents such a fragment or whether the volcanics of the Mozambique Ridge show enriched signatures, which

point towards contamination of basaltic mantle melts via interaction with continental lower crust. Thus all components need to be sampled at the Mozambique Ridge, which may have played a role during its formation.

The project comprised geophysical and dredge operations in the area of the Mozambique Ridge (Fig. 2.1). Streamer, airguns, dredges, and multi-beam systems were used. Seismic reflection profiles were gathered in order to study the sedimentary distribution in relation to the tectonic and oceanographic evolution (red lines in Fig. 2.1). Those profiles cover the Mozambique Ridge with the transition into the deep sea. Dredges were taken on the whole southern Mozambique Ridge (stars in Fig. 2.1). Additionally, two seismic lines and three dredges were collected on the northern Agulhas Plateau.

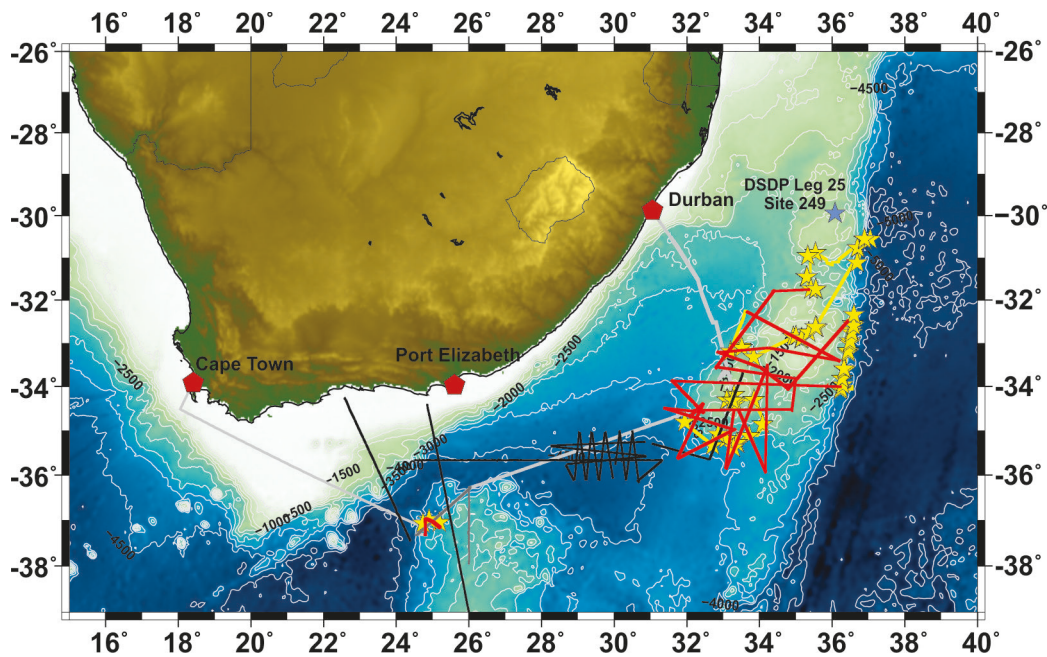


Fig. 2.1: Overview map of the area of interest. Red lines show the seismic lines collected during cruise SO232, grey and black lines show seismic profiles collected in 1998 and 2005, yellow stars the locations of dredges, and the blue star the location of DSDP Leg 25 Site 249.

3. CRUISE ITINERARY

Gabriele Uenzelmann-Neben¹

¹Alfred-Wegener-Institut

Date	Approx. Board time	Speed [kn]	Programme and event	Weather
30.3.	9:00-19:00		On board, loading, set up of equipment	Hot, humid
31.3.	9:00-19:00 22:00		loading, set up of equipment leave harbour	Hot, humid
1.4.	15:30	10	set up of equipment CTD during transit	Sunny, 7-8 bft
2.4.	7:00 9:18	3.5 5	Deployment of seismic equipment Seismic profiling	Sunny, 4 bft
3.4.		5	Seismic profiling	Rain, windy, up to 8 bft
4.4.		5	Seismic profiling	Windy, 6-8 bft
5.4.		5	Seismic profiling	Windy, 6-7 bft
6.4.	14:53 19:52	5 3.5 10	Seismic profiling Retrieval of seismic equipment start dredging	Sunny, 5 bft
7.4.		10	Dredging	Sunny, 3-4 bft
8.4.		10	dredging	Sunny, 4-5 bft
9.4.		10	dredging	Sunny, 5 bft
10.4.	17:45 20:45	10 3.5 5	Dredging Deployment of seismic equipment Seismic profiling	Sunny, 4-5 bft
11.4.		5	Seismic profiling	Sunny, 4-5 bft
12.4.		5	Seismic profiling	Sunny, 4 bft
13.4.		5	Seismic profiling	Sunny, 4-6 bft
14.4.		5	Seismic profiling	Sunny, 6-7 bft
15.4.		5	Seismic profiling	Rainy, 6-7 bft
16.4.	19:00 21:00	5 3.5 10	Seismic profiling Retrieval of seismic equipment dredging	Mixed, 5-6 Bft
17.4.		10	dredging	Sunny, 5 bft
18.4.		10	dredging	Sunny, 5 bft
19.4.		10	dredging	Sunny, 3 bft

Date	Approx. Board time	Speed [kn]	Programme and event	Weather
20.4.	23:00	10 3.5	Dredging Deployment of seismic equipment	Sunny, 3 bft
21.4.	1:54	5	Seismic profiling	Sunny, 3 bft
22.4.		5	Seismic profiling	Rainy, 5 bft
23.4.		5	Seismic profiling	Rainy, 4-6 bft
24.4.		5	Seismic profiling	Rainy, 6 bft
25.4.	23:49	5 3.5	Seismic profiling Retrieval of seismic equipment	Sunny, 4-6 bft
26.4.	3:30	10	dredging	Sunny, 4-6 bft
27.4.		10	dredging	Rainy, 5-6 bft
28.4.		10	dredging	Sunny, 4 bft
29.4.		10	dredging	Sunny, 4 bft
30.4.		10	dredging	Sunny, 3 bft
1.5.		10	dredging	mixed, 5-7 bft
2.5.	10:30 12:58	10 3.5 5	Dredging Deployment of seismic equipment Seismic profiling	Sunny, 6-4 bft
3.5.		5	Seismic profiling	Sunny, 5 bft
4.5.		5	Seismic profiling	Sunny, 5 bft
5.5.		5	Seismic profiling	Stormy, 7-8 bft, 9 bft gusts
6.5.	20:39 23:50	5 3.5 10	Seismic profiling Retrieval of seismic equipment Transit to Agulhas Plateau	Cloudy, 5 bft
7.5.		10	Transit to Agulhas Plateau	Cloudy, 5-6 bft
8.5.	16:15 19:30	10 3.5 5	Transit to Agulhas Plateau Deployment of seismic equipment Seismic profiling	Cloudy, 3 bft
9.5.	5:00 8:45	5 3.5 10	Seismic profiling Retrieval of seismic equipment dredging	Stormy, 8 bft
10.5.	4:30	10 10	Dredging Transit to Cape Town	Stormy, 8-9 bft
11.5.		10	Transit to Cape Town	Sunny, 5 bft
12.5.	8:00		pilot, back in harbour, towing of containers	
13.5.	13:00		scientists off-board	

4. GEOLOGICAL BACKGROUND

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4.1 Tectono-magmatic development since the break-up of Gondwana

The South African gateway is characterised by a number of structural units, whose origin and development since the formation of the gateway are still under discussion: the Agulhas-Falkland Fracture Zone (AFFZ), Agulhas Plateau (AP), Transkei Basin (TB), Mozambique Ridge (MozR), and Madagascar Ridge (MadR). A shallow water basin was formed between 170 Ma and 160 Ma (Bernard *et al.*, 2005, Ghidella *et al.*, 2002, Jokat *et al.*, 2003, Jokat *et al.*, 2004, Lawver *et al.*, 1992, Storey *et al.*, 1996, Storey *et al.*, 2001). The opening of the South Atlantic commenced between 137 Ma and 120 Ma (Gladchenko *et al.*, 1997, Hinz *et al.*, 1999). The earliest traces of oceanic crust in the Natal Valley have been identified for 130 Ma. The separation of the Falkland Plateau (FP) and Africa 110-100 Ma allowed the opening of a deep water connection between the Indian and South Atlantic Oceans (König and Jokat, 2006).

In general, the Gondwana break-up is understood quite well. In contrast to this, structure, composition, and development of the structural units AP, MR, MozR, AR, MadR, and GR within this gateway have been discussed controversially (for location see Fig. 4.1). Seismic studies of the AP have provided indications for a formation of the AP in conjunction with the North East Georgia Rise (NEGR) and the MR as a Large Igneous Province (LIP) (König and Jokat, 2006, Gohl and Uenzelmann-Neben, 2001, Parsieglia *et al.*, 2008, Uenzelmann-Neben *et al.*, 1999). Indications for this have been an anomalously thick lower crust (≤ 15 km) with unusually high seismic P-wave velocities of 7-7.6 km/s, the occurrence of extrusion centres and lava flow sequences, and an overlap of the complex NEGR-AP-MR with continental crust during plate tectonic reconstructions.

The origin of MozR and A) are under heavy debate. Ben Avraham *et al.* (1995) suggest continental fragments embedded into oceanic crust based on low resolution seismic refraction data of Tucholke *et al.* (1981) and Raillard (1990) as well as gravity data. Three dredge samples have also been interpreted as evidence for a continental origin of those structures. During cruise SO183 AISTEK-II with *RV Sonne* in 2005 older basaltic rocks could be sampled using dredges (Jokat, 2006). At DSDP Leg 25 Site 249 Cretaceous basalt was drilled (Thompson *et al.*, 1982). An anomalously thick crust (> 22 km) has been shown by Chetty and Green (1977) based on seismic refraction data. Recently collected seismic refraction data show a similar structure for the southern MozR as has been identified for the AP (Fig. 4.2) (Gohl *et al.*, 2011). A magnetic survey of the MozR also points towards a magmatic origin (König and Jokat, 2010). In case the MozR was formed as a LIP similar to the AP (Gohl and Uenzelmann-Neben, 2001, Parsieglia *et al.*, 2008, Parsieglia *et al.*,

4.1 Tectono-magmatic development since the break-up of Gondwana

2009, Uenzelmann-Neben *et al.*, 1999) or as part of a larger LIP, these structures would have hindered a water mass exchange between Indian and South Atlantic Oceans.

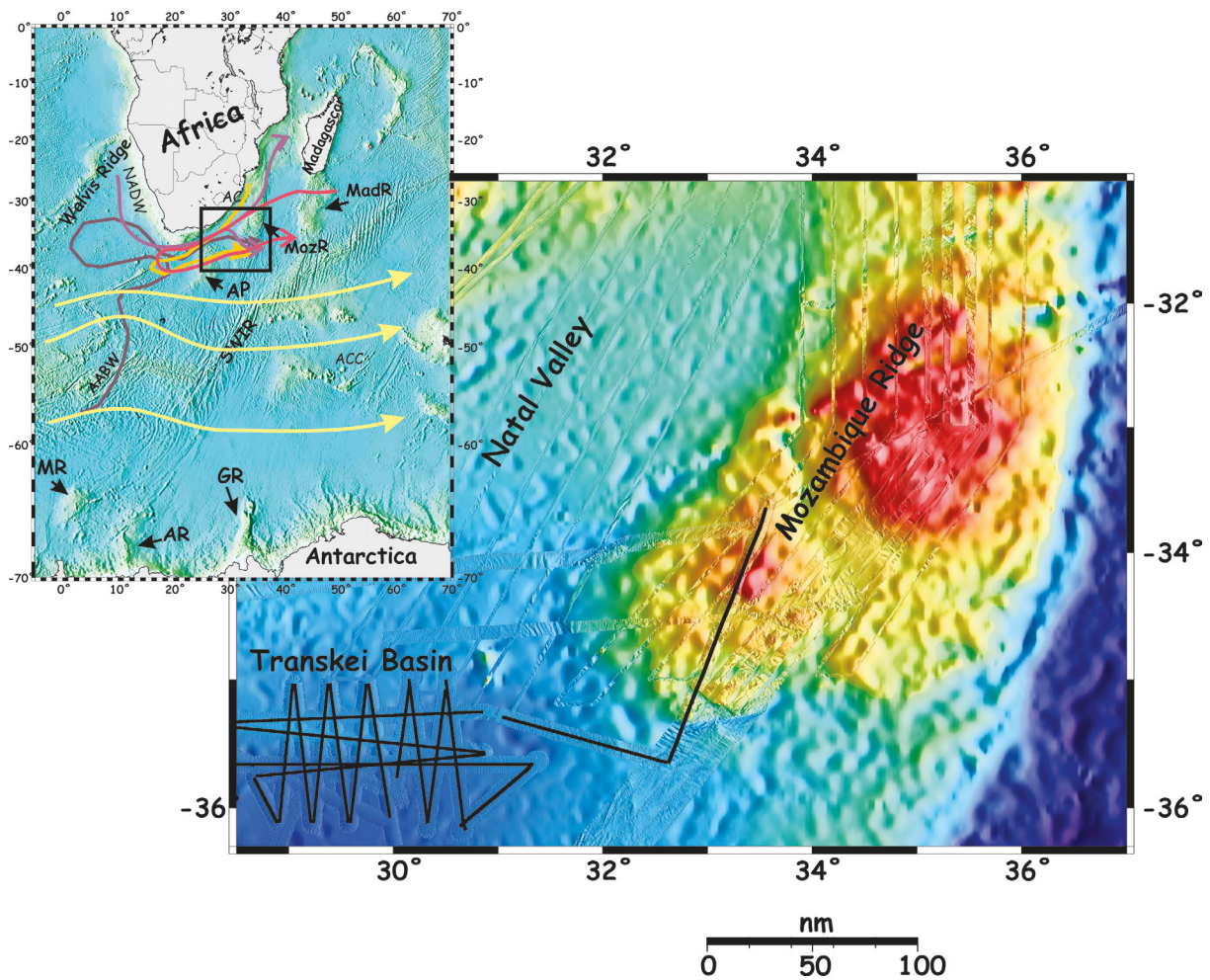


Fig. 4.1: Bathymetric map of the southern Atlantic Ocean and Indian Ocean (insert) and southern Mozambique Ridge (Smith and Sandwell, 1997). AP= Agulhas Plateau, AR=Astrid Ridge, GR= Gunnerus Ridge, MR= Maud Rise, MadR= Madagaskar Ridge, MozR= Mozambique Ridge, SWIR= Southwest-Indian Ridge. AABW= Antarctic Bottomwater, AC= Agulhas Current, ACC= Antarctic Circumpolar Current, NADW= North Atlantic Deep Water. Black lines show the seismic profiles collected in 2005.

Several scientists consider MozR, AR, MadR, and GR as continental fragments in their plate tectonic reconstructions of Gondwana, which results in overlap of those structures with larger units (Hartnady *et al.*, 1992, Martin and Hartnady, 1986, Jokat, 2006). Micro plates for MozR, MadR, and the Falkland Plateau (FP) were discussed as a solution (Lawver *et al.*, 1999, Marks and Stock, 2001, Marks and Tikku, 2001). Other authors vehemently contradict the existence of small independently moving plates. Eagles and König (2008) eliminate this possibility and suggest, that MozR and AR have been formed already during the Karoo volcanism 183-177 Ma.

Leitchenkov *et al.* (2008) postulate a formation of the southern AR during the rift phase and of the northern AR during the early spreading phase between Antarctica and Africa 160 Ma. König and Jokat (2010) as well as Gohl *et al.* (2011) support this hypothesis.

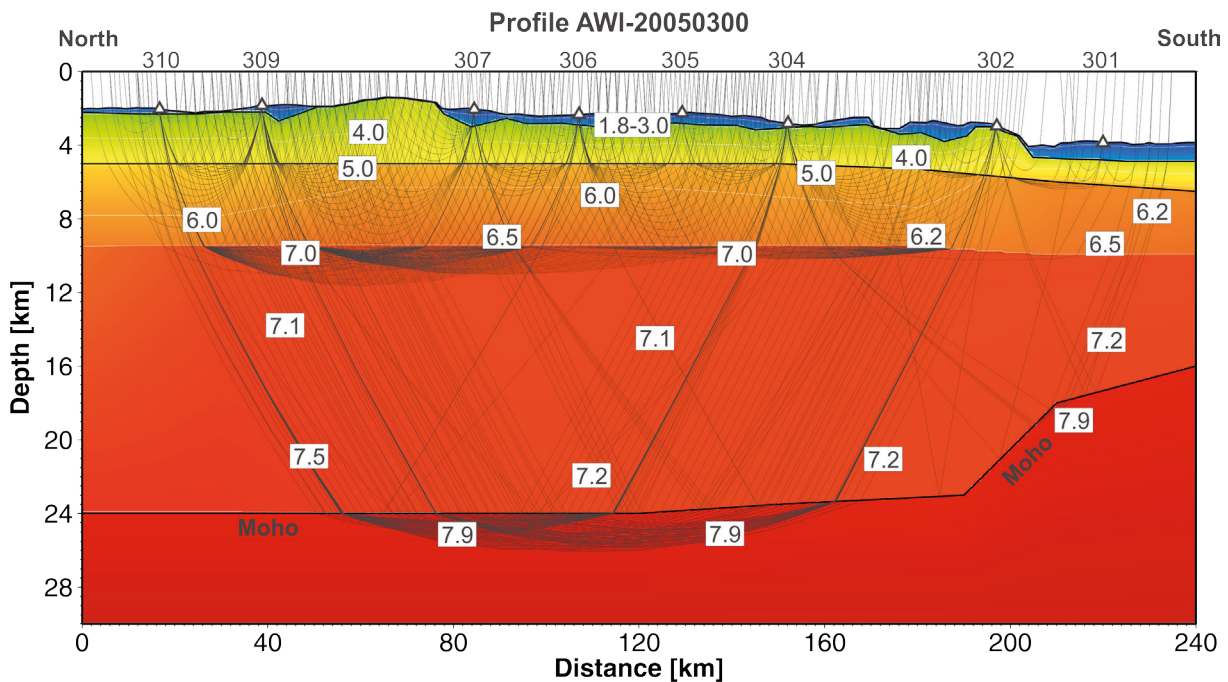


Fig. 4.2: P-wave velocity model based on seismic refraction data showing an anomalously thick crust with high velocities for the southern Mozambique Ridge (Gohl *et al.*, 2011)

4.2 Development of the deep water connection and the oceanic circulation

The water mass exchange between Indian Ocean and South Atlantic has a major influence on the global thermohaline circulation and in this way impacts on our climate (Wunsch, 2002). In this context the seafloor topography, and in this respect the magmatic-tectonic evolution of this gateway plays a major role, since seafloor elevations such as AP and MozR represent barriers for deep and bottom water masses. Circulation systems and depositional environments as well as their modifications are documented in sedimentary structures and sequences.

So called 'bright spots' identified in high resolution seismic reflection data from the TB located between the AP and the MozR indicate a still restricted circulation for the South African gateway for the late Cretaceous (Schlüter and Uenzelmann-Neben, 2008a). These bright spots have been interpreted to represent black shales deposited between 85 Ma and 80 Ma. Black shales are deposited under anoxic conditions, which can be found in enclosed basins (Reading, 1996, Skelton, 2003). More detailed information about the distribution of the black shales and the age and geochemical composition of the crustal fragments leading to a better understanding of the chronological and compositional formation are not available at this point, but are needed to reconstruct the details of the development of the deep water connection.

A commencing open circulation in the area of the AP is indicated by regional hiatus resulting from sea level highstands or erosion due to changing circulation conditions (Tucholke and Carpenter, 1977, Tucholke and Embley, 1984) and sediment drifts identified (Uenzelmann-Neben, 2001, 2002). Especially the study of sediment drifts led to indications for an active Proto-AABW already in Oligocene times (Uenzelmann-Neben *et al.*, 2007). The sedimentary cover of the northern AP is max 400 ms TWT, in many areas less than the seismic resolution (< 5 m). A reason for this could be strong erosion due to the Agulhas Retroflection.

The Transkei Basin is characterised by a prominent sediment drift (Uenzelmann-Neben, 2005) documenting erosion and re-deposition (Schlüter and Uenzelmann-Neben, 2007, 2008b, Niemi *et al.*, 2000). A careful analysis of a seismic survey of the drift showed a reorganisation of the circulation system at the Miocene/Pliocene boundary. For pre-Pliocene times a sediment drift striking in E-W direction can be identified, while the N-S oriented Agulhas Drift has been formed only since the Pliocene (Schlüter and Uenzelmann-Neben, 2007, 2008b).

4.3 Indian mantle domain and Dupal anomaly

The isotopic signature of Indian Ocean MORB is significantly different from the one of Pacific and Atlantic MORB (e.g. Dupré and Allègre, 1983). Indian Ocean MORB can show much higher ratios in $^{87}\text{Sr}/^{86}\text{Sr}$ and lower ratios in $^{143}\text{Nd}/^{144}\text{Nd}$ and $^{176}\text{Hf}/^{177}\text{Hf}$ and higher ratios in $^{208}\text{Pb}/^{204}\text{Pb}$ at given $^{206}\text{Pb}/^{204}\text{Pb}$ (e.g. Hofmann, 2004). The Dupal anomaly (Hart, 1984) is a region where intraplate basaltic rocks show anomalous, enriched Sr, Nd, Hf, and Pb isotopic signatures and which covers the whole earth. The centre can be found between 30° and 40°S. Within the Dupal anomaly mantle basalts show the highest enriched (Enriched Mantle or EM, e.g. Zindler and Hart, 1986) signatures (radiogenic Sr and non-radiogenic Nd and Hf isotope ratios as well as high $\Delta 7/4$ and $\Delta 8/4$). The maximum of the anomaly can be found in the South Atlantic and the Southwest Indian Ocean, e.g. near the southern tip of the African continent near the Mozambique Ridge (Fig. 4.3).

The origin of this anomalies has been discussed controversially. The most popular explanation for the Indian Mantle Domain (part of the Dupal anomaly) is a contamination of the upper mantle by sediments or enriched subcontinental mantle (e.g. Allegre and Turcotte, 1985, Hart, 1988). Other authors see the origin of this geochemical heterogeneity of basement in the Indian Ocean in melting of different parts of Gondwana lithosphere due to a 'super plume', which may also have been responsible for the break-up (Sushchevskaya *et al.*, 2000). Possible hypothesis for the Dupal anomaly are (1) doming of the lower mantle (Castillo, 1988), or (2) enriched blobs in the mantle (Zindler and Hart, 1986), which are attributed to e.g. delaminated subcontinental lithospheric mantle (McKenzie and O'Nions, 1983). Based on similar, enriched isotope signatures of the Parana and Etendeka flood basalts and the Dupal hotspots (e.g. Tristan de Cunha, Discovery, Gough) Hawkesworth *et al.* (1986) postulated a heating and remobilisation of the lithospheric mantle due to a plume head, which then forms the source of this hotspot.

Another possible origin of the Indian Mantle Domain as well as the Dupal anomaly would be continental crustal fragments, because the geochemical characteristics of these anomalies can be explained by a blend of impoverished mantle (MORB

source) and continental crust (upper, with a composition similar to EM2, and lower, with a composition similar to EM1). Such continental fragments can form enriched areas in the upper mantle via delamination of lower continental crust, as has been postulated for the enriched signatures in Indian MORB (Escrig *et al.*, 2004), may have reached the upper mantle as a result of the Gondwana break-up (Hanan *et al.*, 2004, Hoernle *et al.*, 2011), may be located within oceanic lithosphere (Whitmarsh and Party, 1998, Geldmacher *et al.*, 2008, Hoernle, 1998, Hoernle *et al.*, 1991).

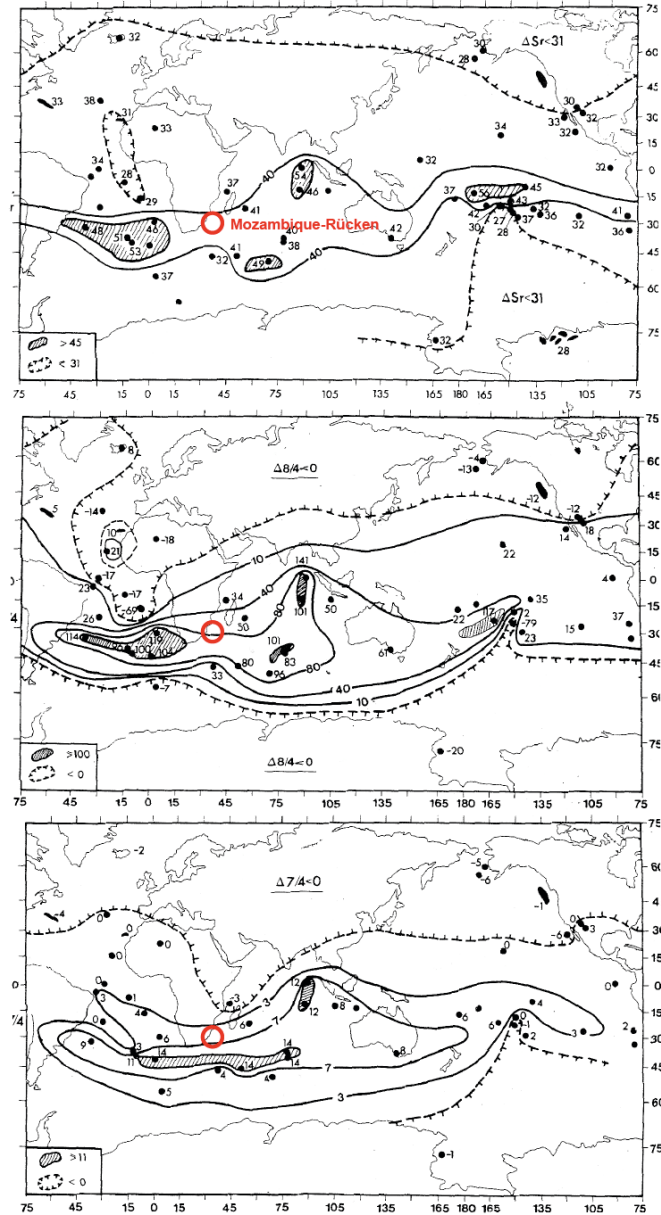


Fig. 4.3: Extent and intensity of the Dupal anomaly on the Southern Hemisphere (top to bottom: ΔSr , $\Delta 8/4$, and $\Delta 7/4$; from Hart, 1984)

5. SCIENTIFIC PROGRAMMES – PRELIMINARY RESULTS

5.1 Seismic reflection profiling

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5.1.1 Methods

The application of seismic methods was one of the primary operational objectives of SO232 in order to obtain information on the structure and sedimentary distribution in the area of the southern Mozambique Ridge. We used a standard multi-channel seismic reflection technique to image the outline and reflectivity characteristics of the sedimentary layers and the structure of the sub-sedimentary basement and lower crust by recording the returning near-vertical wave field. Fig. 5.1 illustrates the principles of this technique.

5.1.2 Seismic equipment

5.1.2.1 Seismic sources, triggering and timing

We used a cluster of 4 GI-guns to resolve the sedimentary layers. A single GI-Gun™ is made of two independent airguns within the same body. The first airgun ("Generator") produces the primary pulse, while the second airgun ("Injector") is used to control the oscillation of the bubble produced by the "Generator". We used the "Generator" with a volume of 0.72 litres (45 in³) and fired the "Injector" (1.68 litres = 105 in³) with a delay of 33 ms. This leads to an almost bubble-free signal. The guns were towed 20 m behind the vessel in 2 m depth and fired every 10 s (~25 m shot interval).

Seismic data acquisition requires a very precise timing system, because seismic sources and recordings systems must be synchronised. A combined electric trigger-clock system was in operation in order (1) to provide the firing signal for the electric airgun valves, and (2) to provide the time-control of the seismic data recording. Due to the variable time difference in the NMEA format of the ship-provided clock and the DVS system, a separate Meinberg GPS clock was used with an antenna mounted on the upper deck. The clock provides UTC date and time (minute and second) pulses.

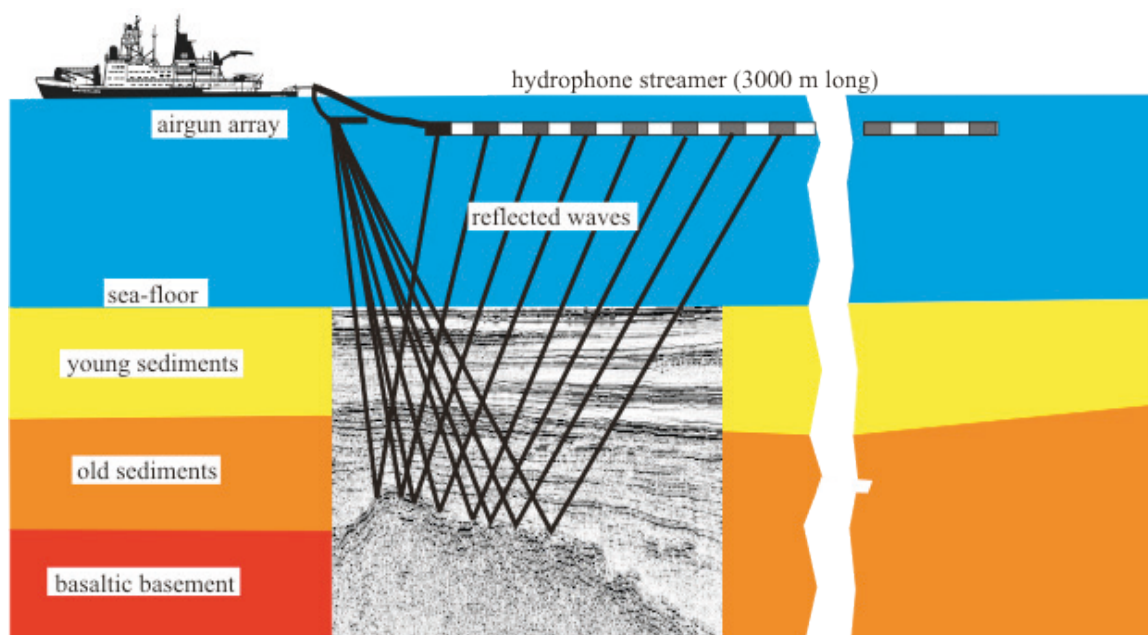


Fig. 5.1: Principle of marine seismic reflection surveying

5.1.2.2 Multi-channel reflection recording system

For multi-channel reflection data acquisition, a complete digital seismic streamer and recording system was used. The system consists of a large capacity, fully integrated, high resolution marine seismic data acquisition system (SERCEL SEAL™), which is composed of both onboard and in-sea equipment (Fig. 5.2). The streamer is a 240-channel hydrophone array, which is coupled to the onboard recorder via a fibre-optic tow leader and a deck lead. The data collected by the hydrophone array is firstly converted from an analogue signal to digital via an A/D converter and then converted to a 24-bit complement format at 0.25 ms sample rate by a DSP. The data is routed to a Line Acquisition Unit Marine (LAUM) at this point, one of these being located every five Acquisition Line Sections or 750 m. The LAUM decimates, filters and compresses the data before routing them through the tow leader and deck lead to the on-board equipment.

The coupling of the streamer with the Control Module (CMXL) is made via the Deck Cable Crossing Unit (DCXU) which also acts as a LAUM for the first 60 channels of the streamer. The CMXL decompresses, demultiplexes and then performs IEEE 32-bit conversion to the data. The data are collected via a network switch and converted to SEG-D by the PRM, the PRM being a processor software module used for formatting data to and from the cartridge drives, the plotters and Seapro QC™.

All system parameters can be set through the Human Computer Interface (HCI), which displays the system's activity such as print parameters, log files, high resolution graphic display and test results.

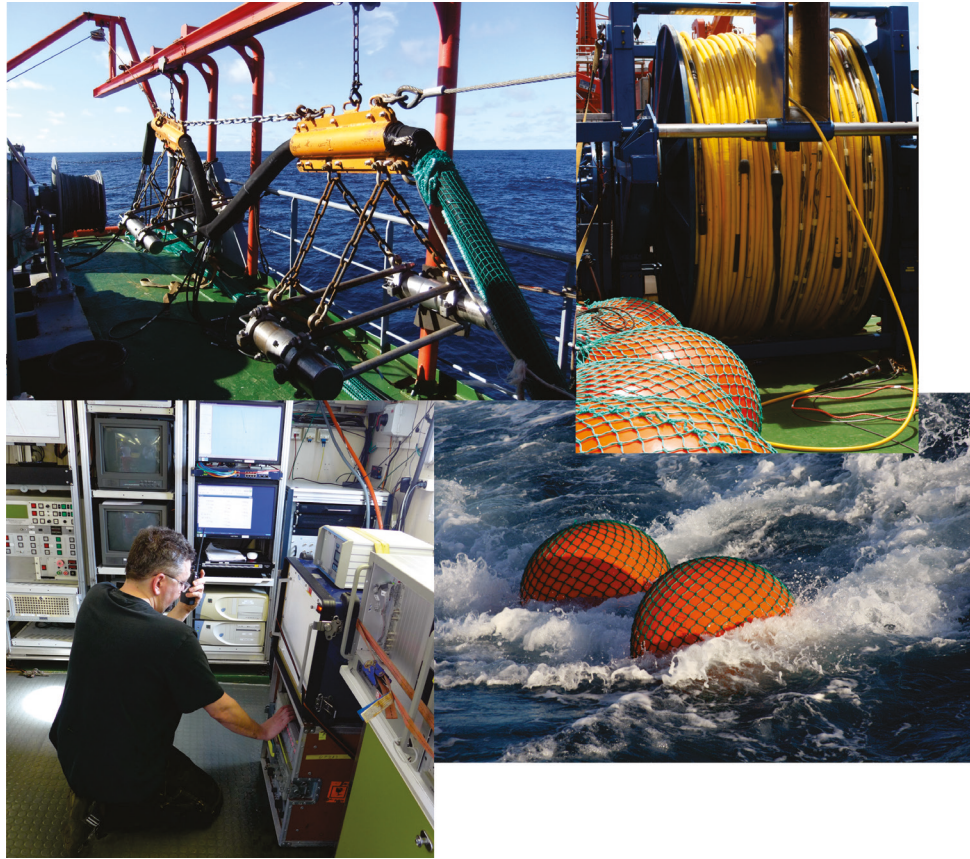


Fig. 5.2: SERCEL SEAL™ digital multichannel seismic system and the recordings units

Tab. 5.1: Specification of SEAL system

Acquisition Line Section Spec.	
Length	150 m
Channels	12
Phones/group	16
1. Group length	12.5 m
2. Sensitivity	20 V/Bar open ended
3. Capacity	256 μ f

Cable depth keeping was monitored on Digicourse™ software, and adjustment to depths was made with Digibirds™, Model 5010. The Digicourse™ software gives a continuously updated graphical display of depths and wing angles via the Digibirds™, which are situated at 300 m intervals along the streamer.

The data were recorded with the following parameters (also Appendix A.5):

Tab. 5.2: Brief description of seismic recording parameters

Profile Name	Active Length	Lead-in	Record Length	Sample Rate
AWI-20140201	3,000 m	191 m	9 s	1 ms
AWI-20140202	3,000 m	191 m	9 s	1 ms
AWI-20140203	3,000 m	191 m	9 s	1 ms
AWI-20140204	3,000 m	191 m	9 s	1 ms
AWI-20140205	3,000 m	191 m	9 s	1 ms
AWI-20140206	3,000 m	191 m	9 s	1 ms
AWI-20140207	3,000 m	191 m	9 s	1 ms
AWI-20140208	3,000 m	191 m	9 s	1 ms
AWI-20140209	3,000 m	191 m	9 s	1 ms
AWI-20140210	3,000 m	191 m	9 s	1 ms
AWI-20140211	3,000 m	191 m	9 s	1 ms
AWI-20140212	3,000 m	191 m	9 s	1 ms
AWI-20140213	3,000 m	191 m	9 s	1 ms
AWI-20140214	3,000 m	191 m	9 s	1 ms
AWI-20140215	3,000 m	191 m	9 s	1 ms
AWI-20140216	3,000 m	191 m	9 s	1 ms
AWI-20140217	3,000 m	191 m	9 s	1 ms
AWI-20140218	3,000 m	191 m	9 s	1 ms
AWI-20140219	3,000 m	191 m	9 s	1 ms
AWI-20140220	3,000 m	191 m	9 s	1 ms
AWI-20140221	3,000 m	191 m	9 s	1 ms
AWI-20140222	3,000 m	191 m	9 s	1 ms
AWI-20140231	3,000 m	191 m	9 s	1 ms
AWI-20140232	3,000 m	191 m	9 s	1 ms

5.1.3 Preliminary results

5.1.3.1 Mozambique Ridge

The seismic grid was set up to image the structure of both basement and sedimentary rocks on the Mozambique Ridge as well as the transition from the ridge into the surrounding basins. Because of the size of the Mozambique Ridge we concentrated our seismic profiling on the southern three segments as depicted in topography (Smith and Sandwell, 1997) and magnetic lineations (König and Jokat, 2010). The northernmost segment unfortunately was too far away to be surveyed in detail additionally, even though DSDP Leg 25 Site 249 was drilled there. A direct correlation with results from this drill site would have been difficult anyway because the northern segment is separated from the southern segments by a deep depression. Sequences wedge out towards the northern segment and across the flank of the segment hindering tracing of seismic horizons. In total, 22 seismic profiles were gathered across the Mozambique Ridge (Fig. 5.3).

5.1 Seismic reflection profiling

Segment 2

Segment 2 of the Mozambique Ridge was crossed by five profiles (lines AWI-20140212, -20140213, -20140216, -20140217, and -20140218, Fig. 5.3). It appears to be composed of at least two basement complexes, which rise up to 1.5 s TWT above the surrounding basement (Fig. 5.4). The flanks of the basement complexes are quite steep and may represent faults. These basement complexes are flat topped but locally show smaller peaks and highs indicating reactivation. Apart from those peaks the surface appears smooth. Both top and internal reflections of basement are inclined away from the centre of the complexes with generally a steeper dip towards the south. In between the basement complexes

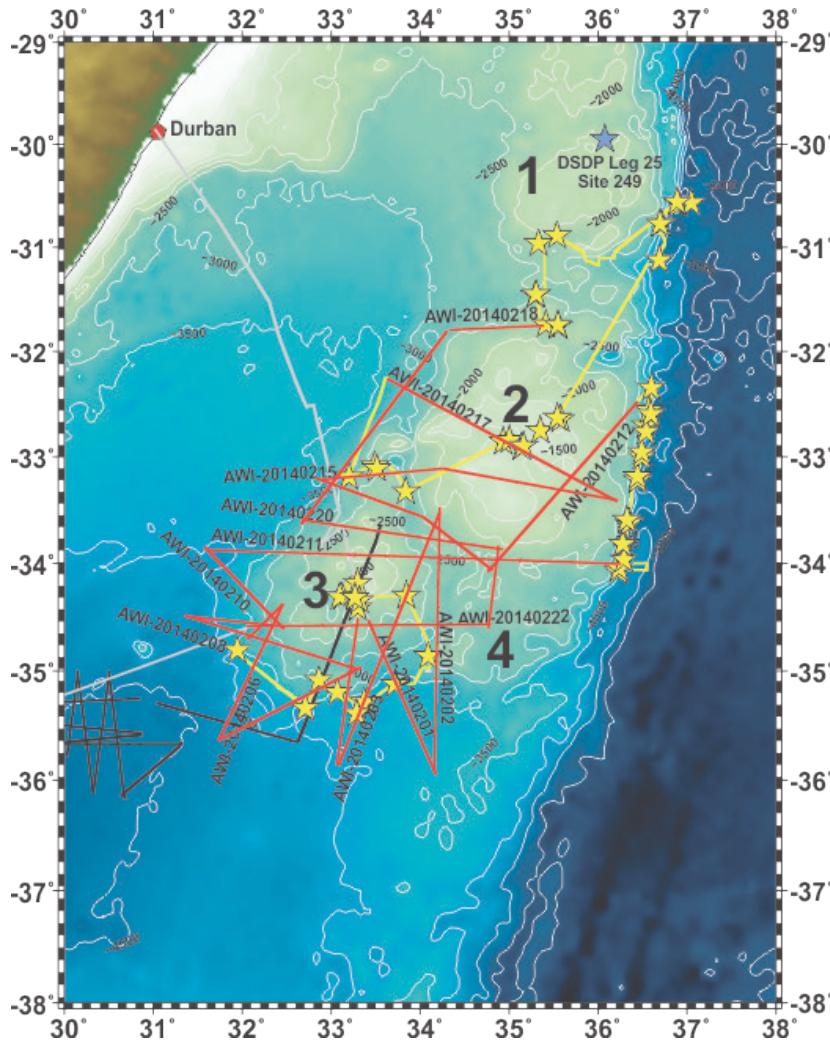


Fig. 5.3: Bathymetric map (Smith and Sandwell, 1997) of the Mozambique Ridge with locations of the collected seismic lines in red. Black lines show the seismic lines collected in 2005. Yellow stars show the dredge locations. Blue star= location of DSDP Leg 25 Site 249. Bold numbers refer to the segments of the ridge.

we observe depressions filled with sedimentary rocks. The maximum thickness of the sedimentary sequences on top of the basement complexes varies between 150 ms TWT and 1,000 ms TWT in the depressions. The sedimentary sequences are characterised by a number of prominent unconformities. Those appear to document several episodes of erosion and current controlled sedimentation, even on the shallow (< 2,000 m water depth) part of the Mozambique Ridge.

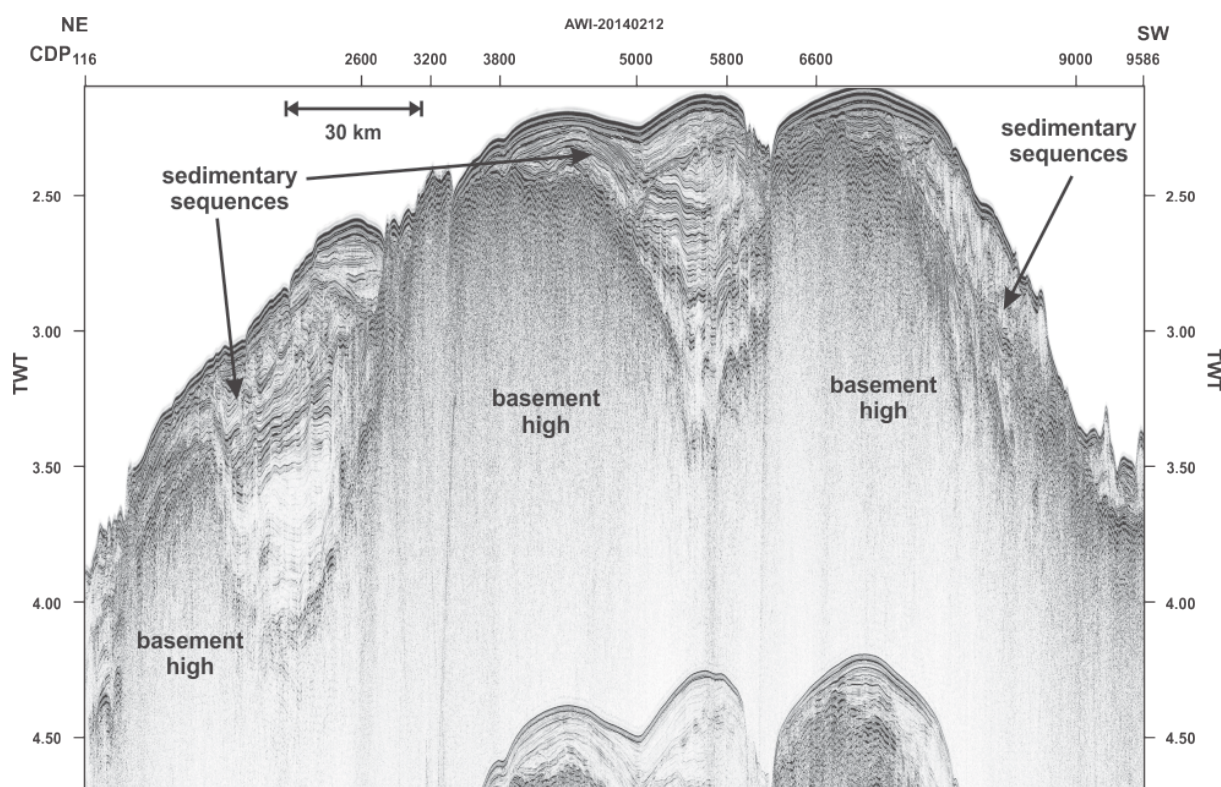


Fig. 5.4: Seismic line AWI-20140212 crossing Segment 2 of the Mozambique Ridge. Notice the deep depressions between the basement complexes.

Those profiles also document the transition into the west-lying Natal Valley. There, the sedimentary column reaches a thickness larger than 1500 ms TWT. On line AWI-20140217 we observe a basement peak piercing the sedimentary sequences up to the seafloor pointing towards a young reactivation (Fig. 5.5).

Segment 3

Seismic lines AWI-20140201, -20140203-20140211, -20140214, -20140215, -20140220 and -20140222 were gathered across Segment 3 of the Mozambique Ridge (Fig. 5.3). Segment 3 appears to be built up of one huge basement complex, which appears fractured with smaller parts of the basement having been downfaulted. This was already suggested by Gohl *et al.* (2011). In several places magmatic centres can be identified. Internal reflections emerge from those magmatic centres towards all directions. Additionally, several kilometre long continuous internal reflections resemble flow structures, which are inclined towards the flanks of the basement high. Especially at the flanks of this segment local highs point towards a reactivation in form of magmatism and faulting. In the southwest the stepdown from the Mozambique Ridge into the basin is covered by up to 500 ms TWT of sedimentary rocks. In the west and south, the sedimentary cover is thinner and the stepdown appears more 'dramatic'. The sedimentary column on the basement high is characterised by several prominent unconformities indicating erosion. The influence of oceanic circulation on sedimentation can also be identified.

5.1 Seismic reflection profiling

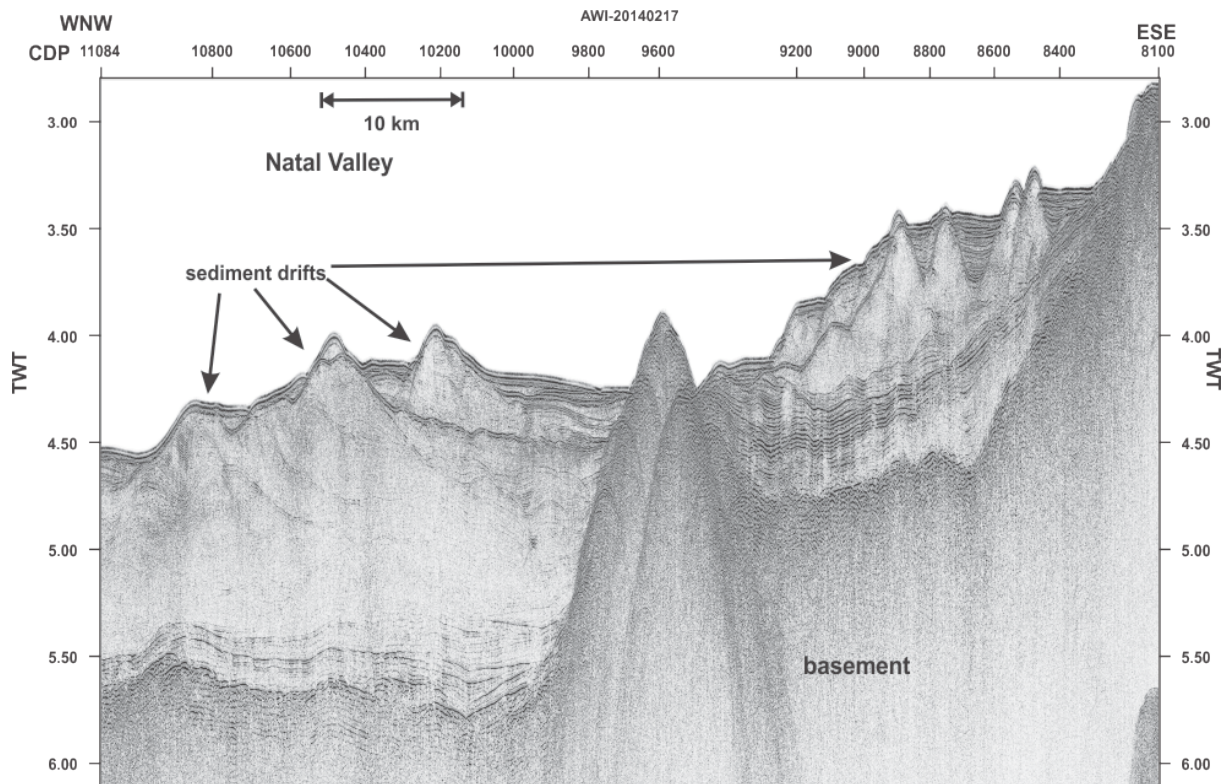


Fig. 5.5: Western part of seismic line AWI-20140217 showing the transition from Segment 2 into the Natal Valley. Notice the young basement high cutting through the sedimentary sequences and the sediment drifts.

In the northwestern part of Segment 3 we observe a 30 km wide 'layer-cake' volcano rising about 750 m above the surrounding seafloor (Fig. 5.6). The top of this structure is very flat showing internal reflections down to 500 ms TWT. This volcano appears to be covered by only a very thin layer of sedimentary rocks. In the east, the flank of the volcano appears to create a channel, which is filled by up to 1000 ms TWT thick current controlled sedimentary features.

The sedimentary cover in the Natal Valley reaches a thickness of 1500 ms TWT. Sediment drifts can be observed. A wide (30 km) and in places deep (500 ms TWT) moat in the south indicates the pathway of AABW.

Segment 4

The seismic lines (AWI-20140202, -20140220, -20140221, and -20140222) across Segment 4 show a basement high from which internal reflections dip both towards the east and the south. A magmatic centre can be observed in the northern part of the basement high characterised by flow-like southward dipping internal reflections and faults in the north. Apart from the magmatic centre the top of basement appears very smooth pointing towards lavaflow sequences or a cover of volcanoclastics. In between Segments 3 and 4 a fault can be observed.

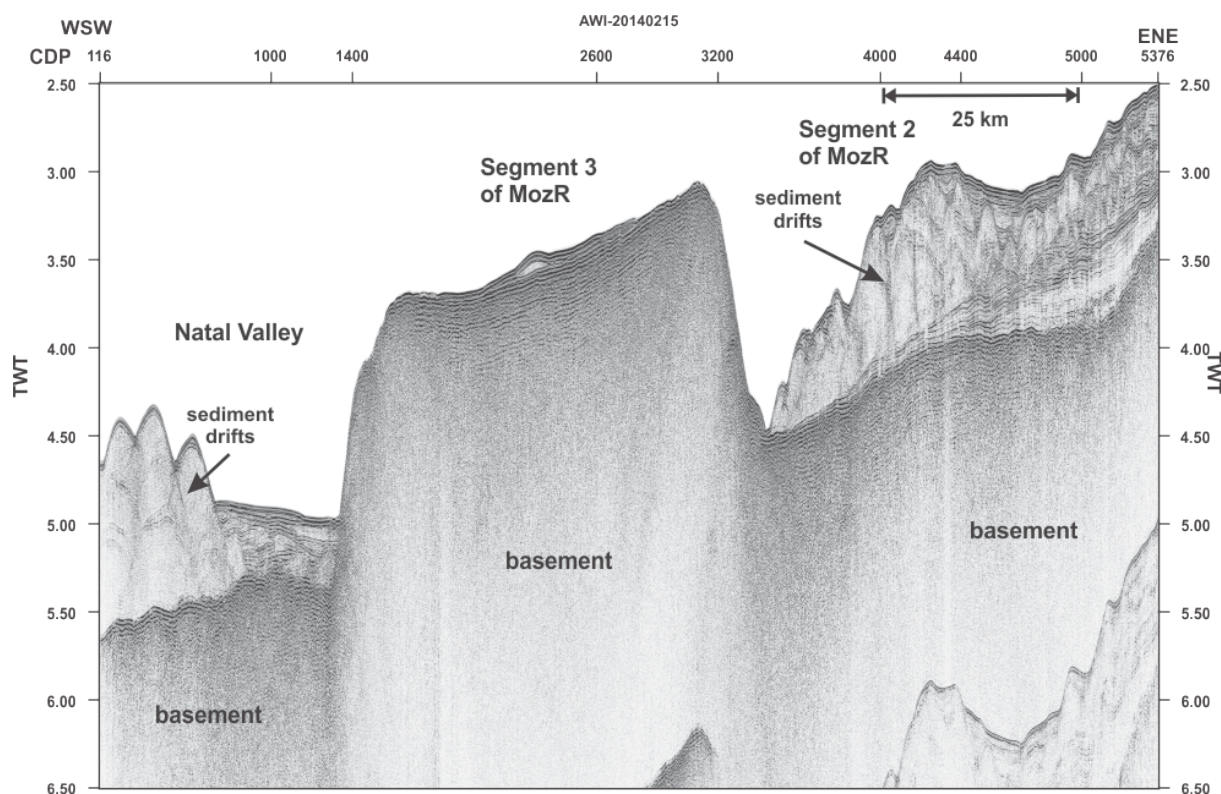


Fig. 5.6: Seismic line AWI-20140215 showing the transition from Segment 2 to Segment 3 into the Natal Valley

Sedimentary layers reach a thickness of 1000 ms TWT both on the ridge and in the basin. The sedimentary column is characterised by prominent unconformities indicating erosion and/or non-deposition. Furthermore, the sedimentary column shows strong evidence of current controlled sedimentation in form of sediment drifts (Fig. 5.7).

5.1.3.2 Pre-site survey on the northern Agulhas Plateau

Uenzelmann-Neben *et al.* (2013) put forward an IODP pre-proposal to drill 8 sites on the Agulhas Plateau, a LIP south of South Africa. Several authors suggested that this LIP was formed between 110 Ma and 95 Ma and thus formed another obstacle within the evolving South African gateway (Gohl *et al.*, 2011, Parsieglia *et al.*, 2008, Uenzelmann-Neben *et al.*, 1999). If this LIP was formed during this period it provides an archive of mid to late Cretaceous climate (Greenhouse) and thermohaline circulation without huge temperature differences between the polar and equatorial regions, as it is known from the present. Proposal 834-pre was reviewed favourably by the Science Evaluation Panel of IODP. For the two northernmost sites, AP-07 and AP-08, only one seismic line without any cross lines or bathymetric information existed. So, we took the opportunity to gather two short cross lines, bathymetric information as well as three dredges during the transit from the Mozambique Ridge to Cape Town (Fig. 5.8).

5.1 Seismic reflection profiling

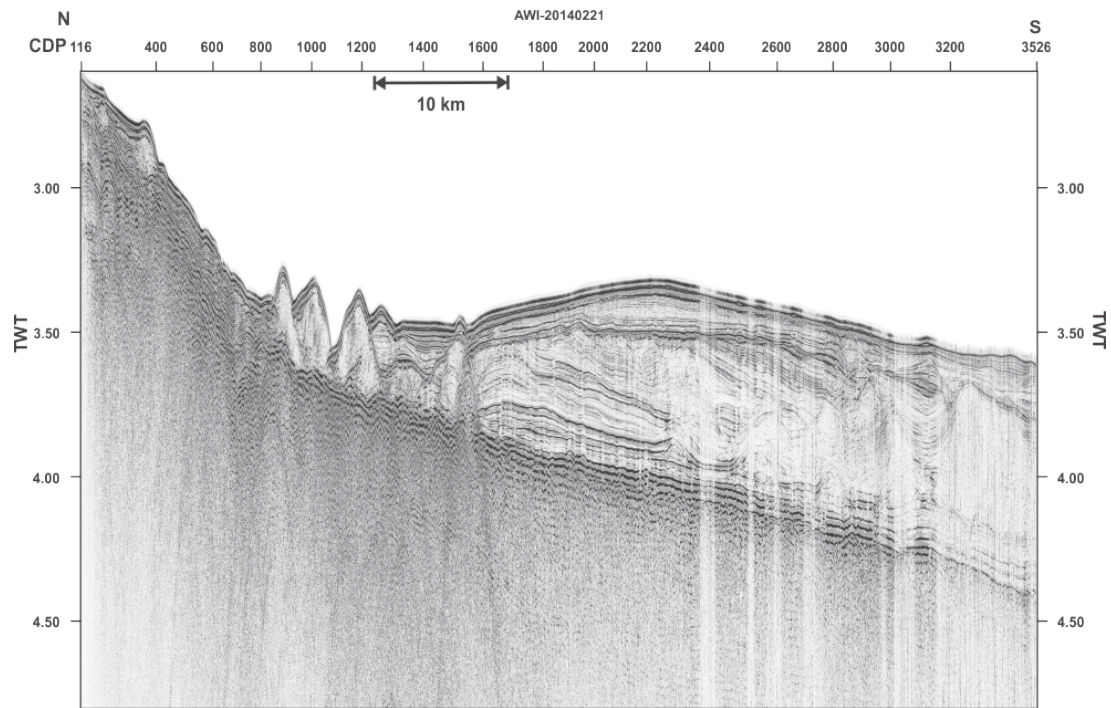


Fig. 5.7: Seismic line AWI-20140221 across Segment 4

Both seismic lines show the rough topography of the northern Agulhas Plateau. While in some places basement appears to be exposed at the seafloor, in other areas sedimentary sequences up to 700 ms TWT in thickness cover the basement. The sedimentary column is characterised by strong erosion and several prominent unconformities.

5.2 Rock sampling

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5.2.1 Methods

5.2.1.1. Dredging and selection of dredge sites

Rock sampling on SO232 was carried out using rectangular chain bag dredges. Chain bag dredges are similar to large buckets with a chain bag attached to their bottom and steel teeth at their openings, which are dragged along the ocean floor by the ship's winch.

General station areas were chosen on the basis of a number of existing datasets. These include:

- (1) predicted bathymetry, derived from gravity data and ship depth soundings (etopo by Smith and Sandwell (1997) and "The GEBCO_08 Grid, version 20091120", <http://www.gebco.net>),
- (2) bathymetric data gained on former *Sonne* cruises (SO182, SO183),
- (3) various swath bathymetry data sets provided by the Bundesamt für Seeschifffahrt und Hydrographie (BSH) and National Oceanic and Atmospheric Administration (NOAA) data bases, and
- (4) preliminary results of seismic surveys conducted on SO232.

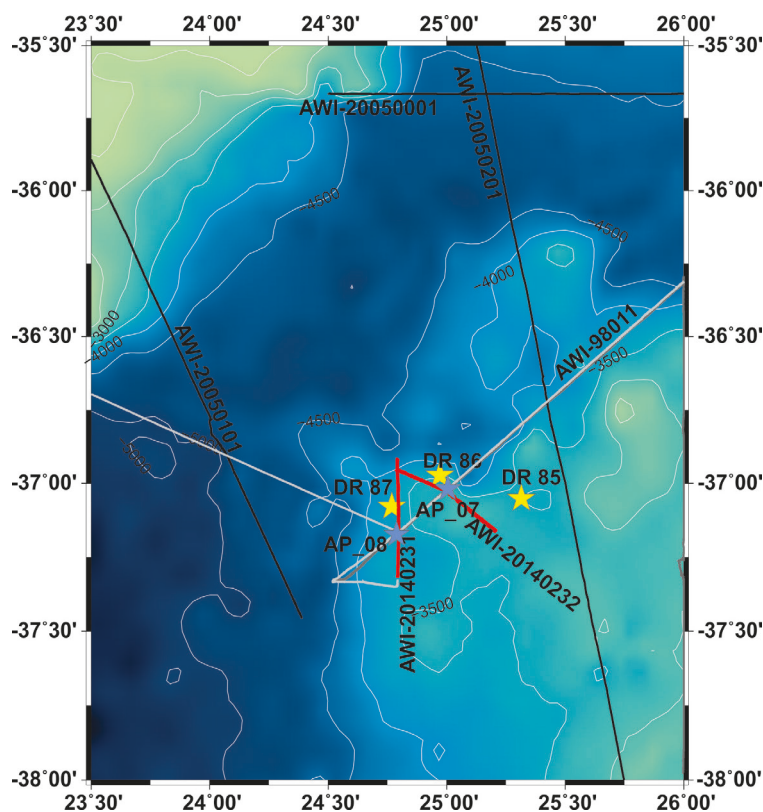


Fig. 5.8: Bathymetric map of the northern Agulhas Plateau with locations of the collected seismic lines in red. Yellow stars show the locations of the collected dredges, black and grey lines the seismic lines collected in 2005 and 1998, resp. Blue stars show the locations of the proposed sites.

5.2 Rock sampling

In particular in un-mapped areas, the final selection of dredge sites was critically dependent on detailed multi-beam echosounding surveys carried out at each station before dredging. Final positioning of the vessel over the dredge sites was done using the bathymetric data gained on the surveys and, if available, seismic data recorded previously in these areas, as well as allowing for weather and drift conditions. Dredge tracks were usually located - depending on the morphology of the structures - on steep slopes, at plateau edges, at scarps, and on the flanks of small cones and of larger seamounts. This was mainly done to avoid areas of thick sedimentary cover.

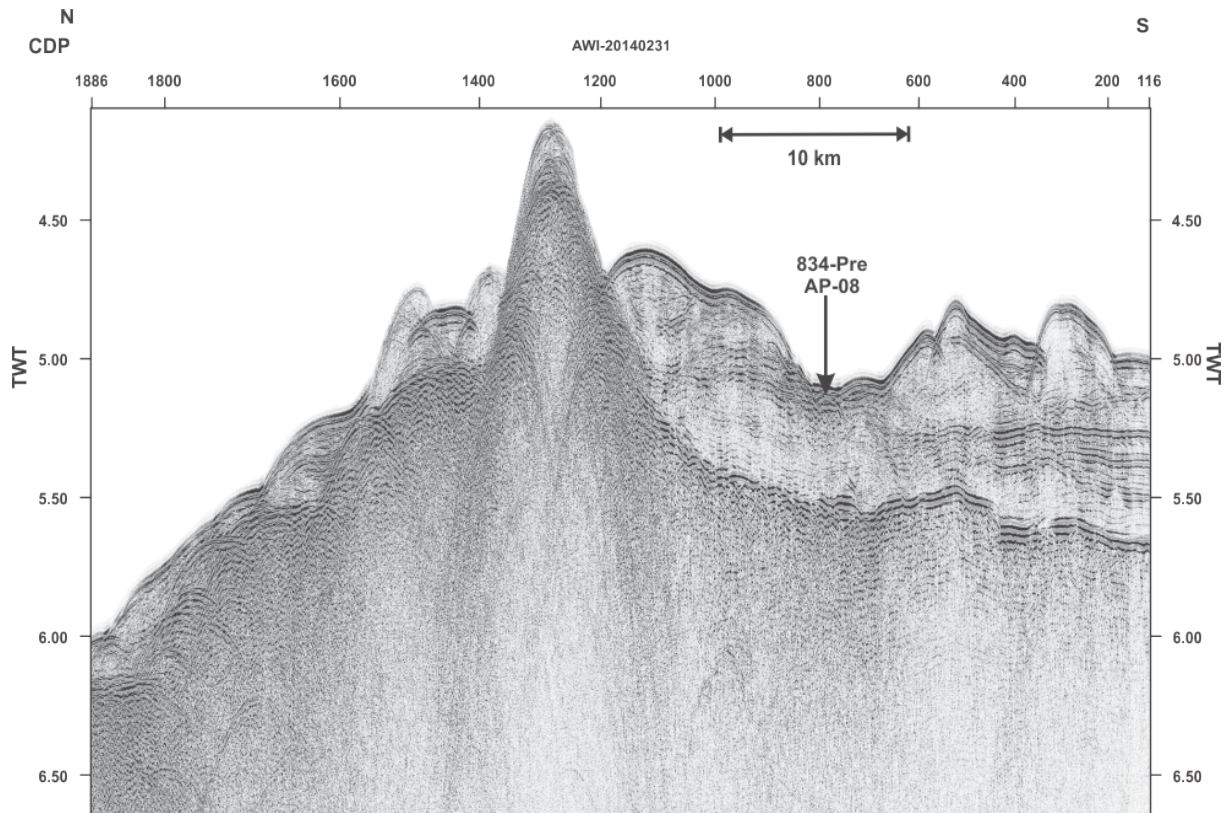


Fig. 5.9: Seismic line AWI-20140231 showing the location of Site AP-08 proposed to be drilled by IODP proposal 834

5.2.1.2 Shipboard procedure

Once onboard, a selection of the rocks was cleaned and cut using a rock saw. They were then examined with a hand lens and microscope, and grouped according to their lithologies and degree of submarine weathering. The immediate aim was to determine whether material suitable for geochemistry and radiometric age dating had been recovered. Suitable samples have an unweathered and unaltered groundmass, empty vesicles, glassy rims (ideally), and any phenocrysts that are fresh. If suitable samples were present, the ship moved to the next station. If they were not, then the importance of obtaining samples from the station was weighted against the available time. However, a second dredge nearby was necessary only in a very few cases.

Fresh blocs of representative samples were then cut for thin section and microprobe preparation, geochemistry and further processes to remove manganese and alteration products and/or to extract glass (if applicable). Each of these sub-samples, together with any remaining bulk sample, was described, labelled, and finally sealed in either plastic bags or bubble wrap for transportation to GEOMAR or cooperating institutions.

5.2.1.3 Shore based analyses

Magmatic rocks sampled by *Sonne* from the ocean floor will be analysed using a variety of different geochemical methods. The ages of whole rocks and minerals will be determined by $^{40}\text{Ar}/^{39}\text{Ar}$ laser dating. Major element geochemistry by X-ray fluorescence (XRF) and electron microprobe (EMP) will constrain magma chamber processes within the crust, and also yield information on the average depth of melting, temperature and source composition to a first approximation. Phenocryst assemblages and compositions will be used to quantify magma evolution, e.g. differentiation, accumulation and wall rock assimilation. Petrologic studies of the volcanic rocks will also help to constrain the conditions under which the melts formed (e.g., melting depths and temperatures). Further analytical effort will concentrate on methods that constrain deep seated mantle processes. For example, trace element data by inductively coupled plasma mass spectrometry (ICP-MS) will help to define the degree of mantle melting and help to characterize the chemical composition of the source. Long-lived radiogenic isotopic ratios by Thermal Ionization Mass Spectrometry (TIMS) and Multi-collector ICP-MS such as $^{87}\text{Sr}/^{86}\text{Sr}$, $^{143}\text{Nd}/^{144}\text{Nd}$, $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, $^{208}\text{Pb}/^{204}\text{Pb}$, and $^{187}\text{Hf}/^{188}\text{Hf}$ are independent of the melting process and reflect the long term evolution of a source region and thus serve as tracers to identify mantle and recycled crustal sources. Additionally, morphological studies and volcanological analyses of the dredged rocks will be used to constrain eruption processes, eruption environment and evolution of the volcanoes. Through integration of the various geochemical parameters, the morphological and volcanological data, and the age data the origin and evolution of the sampled structures can be reconstructed.

Non-magmatic rocks and Mn-Fe oxides yielded by dredging will be transferred to co-operating specialists for further shore based analyses.

5.2.2 Sampling report and preliminary results

According to the predicted bathymetry, the main part of the Mozambique Ridge appears to consist of three circular to oval shaped plateau-like structures being c. 160 - 250 km in diameter (herein called southwestern, central, and northern plateau). A fourth, less distinct bathymetric high measuring c. 120 km in diameter forms the southeastern corner of the ridge (Fig. 5.3) These structural units rise up to c. 4,000 m above the surrounding abyssal plain at c. 5,000 m b.s.l. and are separated by E-W and NW-SE-trending valleys. According to König and Jokat (2010), high amplitude magnetic anomalies at the major structural boundaries suggest that the different plateaus of the ridge were formed at different times. These authors postulate, that the formation of the Mozambique Ridge started with the emplacement of the northern plateau at the prolongation of the Astrid Ridge (located off Dronning Maud Land / Antarctica) at c. 140 Ma. The central and the southwestern plateau probably started to develop contemporaneously at c. 136 Ma but the volcanic activity in the south lasted longer and probably terminated at c. 125 Ma. The less distinct southeastern high may have formed at c. 124 -

122 Ma during the final phase of separation of the Mozambique Ridge (as part of the African continent) from Antarctica. Thus, König and Jokat (2010) consider the plateaus forming the Mozambique Ridge as products of multiple volcanic episodes during the initial opening between Africa and Antarctica. However, small circular volcanic cones, being just a couple of hundred meters high and 500 - 3,000 in diameter, are scattered on the southwestern plateau but also appear at places on the other plateaus. It is unlikely that these tiny features have survived since Early Cretaceous without being covered by sediments or being affected by erosional or tectonic processes. Therefore they have most likely been formed by a significantly younger phase of volcanic activity. This hypothesis is consistent with preliminary results of seismic surveys conducted on SO232, which doubtlessly show deformation of sedimentary successions by intruding magma (see chapter 5.1.3). Another remarkable morphological feature of the Mozambique Ridge is its eastern margin, which is formed by a steep, approximately N-S trending scarp. A large, elongated bloc-like structure incorporated in the northern part of the scarp may be a continental fragment, which has been displaced from the African continent during the early rifting between Africa and Antarctica e.g. Mougénot *et al.*, 1991, König and Jokat, 2010).

Comprehensive hard rock sampling of all major geomorphological units of the Mozambique Ridge is the basic precondition to achieve the petrological goals of SO232. Therefore, dredging has been carried out at the base and at presumably younger volcanic structures of all three major plateaus as well as systematically along the central and northern part of the eastern plateau margin. No sampling attempts have been made at the southeastern bathymetric high because of its morphologically smooth appearance on maps derived from predicted bathymetry and due to time constraints. Minor mapping and rock sampling attempts have additionally been carried out (1) at the "Andrew Bain" fracture zone (König and Jokat, 2010) off the eastern margin of the Mozambique Ridge to recover reference samples from the adjacent oceanic crust and (2) at the northern tip of Agulhas Plateau c. 400 nm WSW of the Mozambique Ridge to enlarge the data base for a planned IODP full proposal.

Rock sampling on SO232 was accompanied by a minor biological programme to investigate benthic animals found on the dredged rocks and meiofauna recovered by sediment traps in our dredges. The biological studies focus on the biodiversity and biogeography of benthic meio- and macrofaunal key groups such as Kinorhyncha, Loricifera, Porifera, Brachiopoda, and Bryozoa. These investigations complement results of the previous expeditions M48-3 to the Angola Basin and MSM19/3 to the Agulhas Ridge as well as the upcoming expedition SO233 WALVIS II to the Walvis Ridge.

The following section gives background information and short summaries of the features sampled and/or mapped on SO232 and on the rocks obtained by dredging. Refer to Appendix A.6 for a detailed summary of the dredge tracks and rock descriptions. Distances, dimensions and heights given in this chapter are approximate and are only included to give a rough idea of dimensions of morphological features. Distances between seamounts are given between the seamount tops.

5.2.2.1 Southwestern plateau

The southwestern plateau of the Mozambique Ridge extends from c. 33°S to 35°20'S and 31°40'E to 34°30'E and rises from c. 4,200 m b.s.l. at its southern

margin to c. 1,200 m b.s.l. in the shallowest central portion (Fig. 5.10). Attempts to sample the igneous basement concentrated on the central bathymetric high (DR06 – 12) and the southern margin (DR13 – 21). This strategy mainly reflects considerations concerning the presence of steep slopes, which based on experience prove most useful when dredging older structures and the intention to sample the overall structure from base to top in order to cover the largest possible age range assuming a layer cake stratigraphy. While the central high appeared as a circular cone with fairly steep southern and western flanks on predicted bathymetric maps, the southern margin of the southwestern plateau is characterized by E-W and WNW-ESE striking lineaments that could be faults with potential exposures of igneous basement. Indeed seismic reflection lines (AWI-20140201 through AWI-20140204) obtained prior to dredging revealed several normal fault bounded basement exposures along the southern margin and east of the central high.

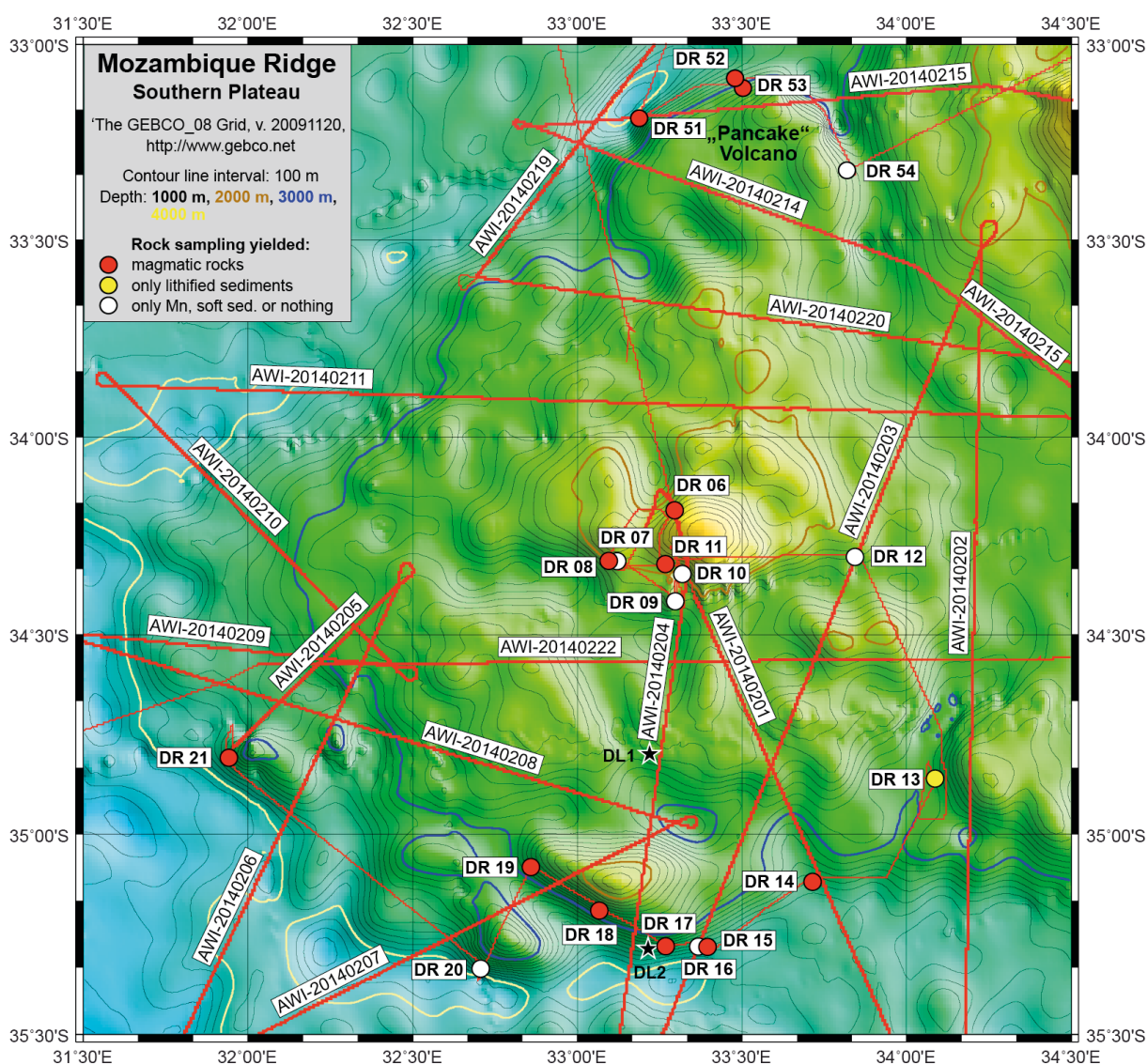


Fig. 5.10: Overview map showing the southwestern plateau of the Mozambique Ridge (based on "The GEBCO_08 Grid, version 20091120", <http://www.gebco.net>). Dots mark SO232 dredge stations, black stars dredge stations conducted on cruise SO183, and red lines the SO232 ship's track. Seismic profiles recorded on SO232 are marked by thick lines.

5.2 Rock sampling

Central High (DR06 – 12)

Multi-beam echosounding displays several small (<3 km in diameter) cones within the central high (Fig. 5.11). They are interpreted to be of volcanic origin and thus document a later magmatic phase after plateau formation and possibly long after initial coverage by sediments. DR06 targeted a cone in the top region of the central high and was conducted between 1,473 and 1,250 m b.s.l. along its NW flank. The dredge returned one third full with two large m-sized Mn crusts and several larger pieces of volcanoclastic material. Closer inspection exposed a few rounded clasts of highly vesicular, strongly altered lava fragments (samples DR06-1 to -4). The material appears too altered to be useful for further geochemical and geochronological investigations. Still, the high vesicularity of lava and abundant volcanoclastic material witness high degrees of degassing and fragmentation that most likely result from eruptions in shallower water depths at reduced loading pressures of the overlying water column.

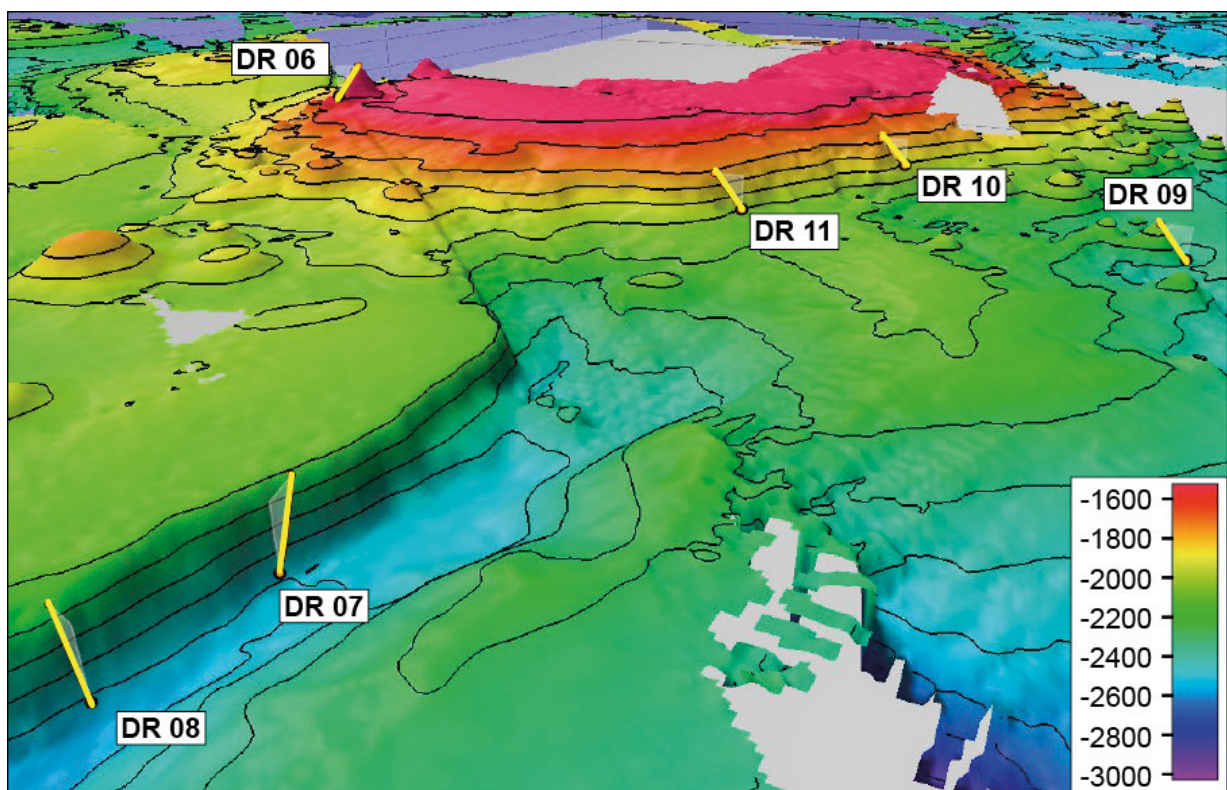


Fig. 5.11: 3D-map showing the central high of the southwestern plateau and SO232 dredge tracks marked by yellow lines (view from WSW to ENE). Note the numerous small cone-like structures being scattered on the central high. The map is based on multi beam data recorded on SO232 and SO183 as well as on data provided by BSH and NOAA (exaggeration: 3x; interval of contour lines: 100 m).

Mapping the western flank of the central high did not provide any promising targets for rock recovery by dredging but discovered a south facing, E-W striking morphological step, WSW of the central high. This cliff could be either of erosional or tectonic origin and despite missing seismic reflection data seemed to cut deep enough into the strata to possibly expose igneous basement. DR07 and DR08 lie c. 1.5 nm apart from each other and were carried out between c. 2,500 and 2,100 m

b.s.l. (Fig. 5.11). DR07 returned empty and DR08 delivered one bloc of a volcanic breccia containing several lava clasts along with Mn coated corals. Samples DR08-1A through E are rounded lava fragments from this breccia. They are all dense and aphyric with a strongly oxidized yellowish-brown groundmass. Geochemical use seems limited and thin sections need to be checked for suitable groundmass phenocrysts for possible age dating.



Fig. 5.12: Highly feldspar-phyric lava fragment from calcite supported breccia



Fig. 5.13: Chilled pillow margin with 1.5 cm thick fresh glass rind dissected by palagonite filled cracks

Southern margin (DR13 – 21)

The first dredge (DR13) along the southern margin was carried out in the eastern sector along the northern flank of a small E-W trending valley at c. 3,000 to 2,770 m b.s.l. but returned only yellowish-brown lithified sediments, soft sediment and a Mn nodule. DR14 was performed at 3,500 to 3,150 m b.s.l. where seismic profile AWI-20140201 intersects the southern margin and seismic reflection data indicates a later intrusion or diking event, which caused upward bending of strata along the igneous interface. The dredge obtained variable sized pillow lava fragments (10-40 cm) some with chilled margins that still contained abundant fresh glass (samples DR14-G1 and -G2; Fig. 5.13). The groundmass of the pillows is microcrystalline with only a few feldspar phenocrysts (<1%) and c. 10% partially filled vesicles. The groundmass is variably altered ranging from grey to light brown oxidized areas but contains abundant feldspar microphenocrysts that appear suitable for age dating. Abundant cracks (<<0.5 mm) are filled with Mn, but the Mn coating of lava fragments is fairly thin (<<1mm) indicating possibly limited times of seawater exposure. Overall the samples need careful inspection when preparing them for bulk rock chemistry. The two discovered glassy margins are fairly thick (c. 1cm) and contain thin cracks filled with palagonite that needs to be avoided when preparing the samples (Fig. 5.13). The presence of fresh glass is also, but not necessarily, consistent with the volcanism belonging to a later magmatic event, as proposed from seismics, leaving less time for glass alteration.

5.2 Rock sampling

The next two dredges (DR15 and -16) intersect with line AWI-20140203 at the steep southern margin of the Mozambique Ridge (Fig. 5.10) where the seismic reflection data mirrors multiple normal faults. DR15 was carried out along a south facing slope between c. 4,000 and 3,500 m b.s.l. and returned a few, Mn encrusted (<1cm), feldspar-phyric pillow lava fragments. The lava samples appear petrographically similar throughout the dredge with variable amounts (1-10%) of 1-4 mm sized plagioclase phenocrysts that seem fresh in places. Groundmass alteration ranges from relatively fresh in DR15-1 to more yellowish-brown oxidized variations in the vast majority of samples. Overall the matrix is quite dense containing less than 1%, mostly filled vesicles. A second attempt (DR16) to return rocks from this area failed. The next dredge (DR17), located c. 10 nm west of DR15/16 and in close vicinity of dredge station DL2 of the previous cruise SO183, aimed for the upper slope of the southern margin at c. 3,450 to 3,200 m b.s.l. and obtained a volcanoclastic rock and a Mn crust. Further west the southern margin splits into a NW-SE and a E-W striking branch (Fig. 5.14).

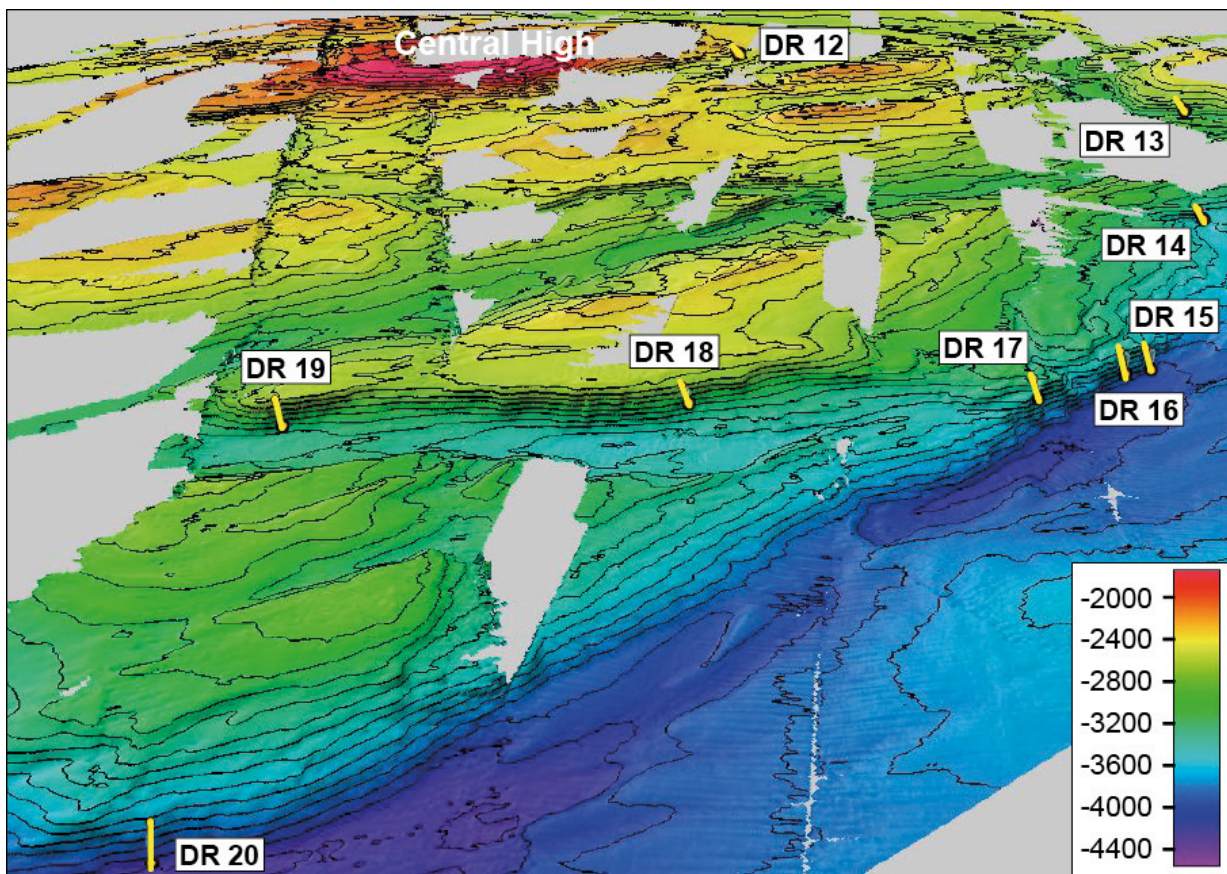


Fig. 5.14: 3D-map showing the southern margin of the southwestern plateau with the central high in the background and SO232 dredge tracks DR12 - 20 (view from SW to NE). E-W and WNW-ESE striking lineaments are characteristic for this section of the plateau margin. Exaggeration, contours, and data sources as in Fig. 5.11.

DR18 and -19 followed the northwestern lineament (Fig. 5.14). DR18 obtained a huge, m-sized Mn crust bloc (Fig. 5.15) and two rocks from c. 3,000 to 2,700 m b.s.l. along the upper part of the SW facing slope. Notably the Mn-crust bloc contained rounded to sub angular dm-sized clasts of a medium grained subvolcanic

(microgabbro) or doleritic rock (DR18-1, -2) and angular lava fragments. The holocrystalline rocks possess a coarse grained groundmass consisting of feldspar, pyroxene, and possibly altered olivine along with c. 7%, 1-3 mm-sized feldspar phenocrysts (Fig. 5.16). The rounded appearance of sample DR18-1 was initially interpreted to indicate a dropstone origin but the fact that the sample occurred within a thick several dm thick Mn-crust together with an angular clast of similar petrography is more in favour of eroding a nearby intrusion / dike or centre of a massive lava flow. The volcanic clasts are fine grained with minor feldspar phenocrysts but the groundmass is very strongly altered.

DR19 was carried out at the western tip of the NW-SE striking lineament from c. 3,100 to 2,600 m b.s.l. along the entire SW facing slope. It recovered Mn encrusted aphyric lava (Fig. 5.17) that was freshly broken off the ground as documented by newly broken cracks along the underside of the lava fragments. Thus, an *in situ* massive lava flow has been sampled here. The lava is unusually fresh reflecting the dense, massive texture with limited pathways for fluids. Overall, the lava is very fine grained and almost aphyric with less than 1%, up to 2 mm sized feldspar phenocrysts. The petrography is homogeneous throughout the entire dredge and varies foremost in the degree of groundmass alteration that ranges from pristine light grey to light greenish patches at alteration halos along small cracks to brownish groundmass oxidation in the most strongly altered samples (Fig. 5.17). In general, DR19 is highly suitable for geochronology (groundmass and microphenocrysts) and detailed geochemical investigations. DR20 c. 20 nm SSW of DR19 aimed for the southern margin along its E-W striking lineament at the lower section of the slope (c. 4,200 to 3,700 m b.s.l.) but returned empty.



Fig. 5.15: Large m-sized Mn crust of DR18 on deck. Note ruler (20 cm) and dredge for scale



Fig. 5.16: Holocrystalline subvolcanic or doleritic rock with large feldspar phenocrysts recovered as rounded clast from Mn-crust bloc of DR18

The last dredge (DR21) along the southern margin of the southwestern plateau was located at its SW corner along the southern flank of a seamount from c. 3,800 to 3,400 m b.s.l. (Fig. 5.18). Two angular lava fragments were obtained with DR21-1 being a slightly altered olivine phyric lava with fine grained, dense groundmass (Fig. 5.19). Feldspar microphenocrysts are abundant in the groundmass and appear useful for age dating. The other sample (DR21-2) is more severely altered with yellowish-brown groundmass.

5.2 Rock sampling

"Pancake" volcano (DR51 - 54)

The northwestern tip of the southern plateau is separated from the central plateau by a NNW-SSE striking valley. It extends from 33°00'E to 33°50'E and terminates at 33°05'S. In principle it forms a large half-moon shaped structure with a flat top, giving it a pancake like appearance of c. 75 km across (Fig. 5.20). The circular plateau edge forms a fairly steep slope that dips from 2,400-2,700 m b.s.l. to more than 3,700 m b.s.l. along its northwestern corner. We speculate that the structure formed by radial outflow of lava from a central vent. DR51 through DR54 aimed for the circular plateau margin going clock wise from northwest to the east.



Fig. 5.17: Fairly fresh aphyric lava, dredged in situ at southern margin of Mozambique Ridge

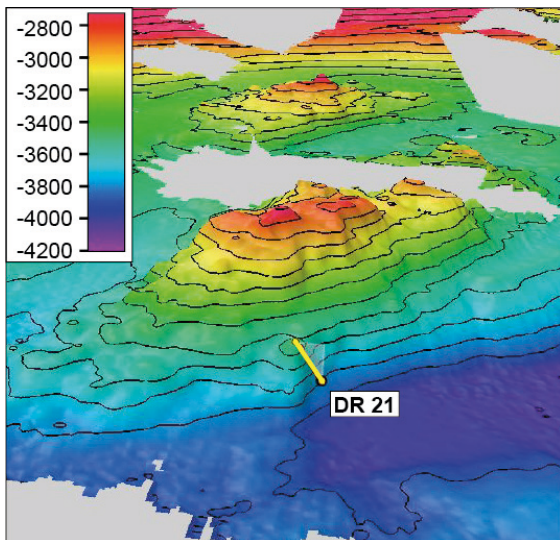


Fig. 5.18: 3D-map of the seamount at the SW corner of the southwestern plateau showing DR21 (view from WSW to ENE) Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.19: Medium altered fine grained, dense lava fragments recovered by DR21. Red patches are probably altered olivine phenocrysts

The first dredge was carried out along the base of the northwest facing slope between c. 3,440 and 2,975 m b.s.l. and returned 2/3 full with lava fragments,

volcaniclastics, lithified sediments and Mn-crusts. The lava fragments are uniformly plagioclase porphyric (10-15%, several mm sized), some with chilled margins (e.g. DR51-8). Minor fresh olivine has been observed in DR51-2. The groundmass is dense and surprisingly fresh in most samples (DR51-1 to -4; Fig. 5.21) with increasing red-brown oxidized patches from DR51-5 onwards. Overall the lavas of DR51 are highly suitable for geochronology and full scale geochemical analysis. Sediments of this dredge include breccias with rounded lava fragments and lithified mud stones.

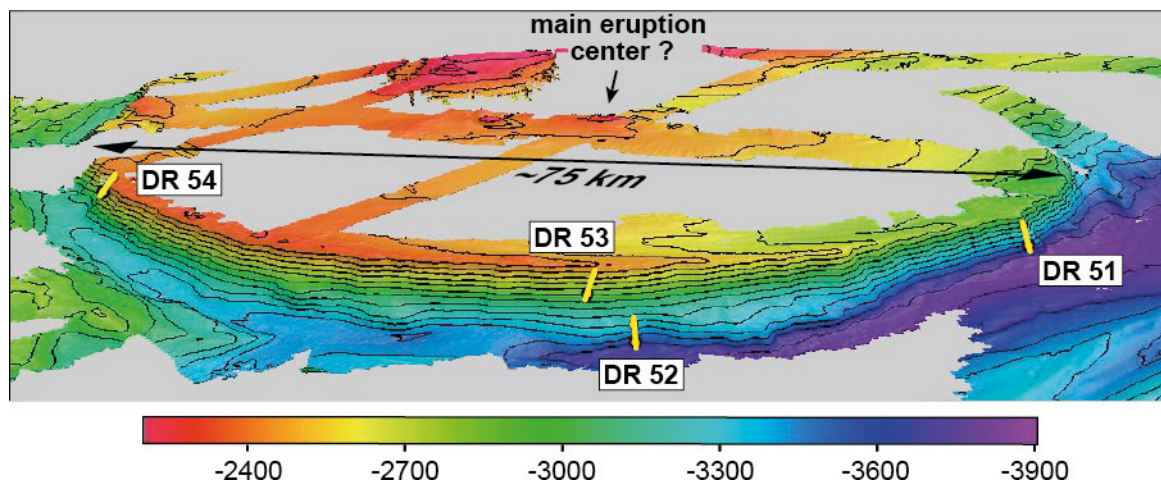


Fig. 5.20: 3D-map of the flat-topped, pancake-like volcanic structure at the northern margin of the southwestern plateau with dredge stations DR51-54 (view from N to S). According to SO232 seismic profile AWI-20140214, the lava flows, which built up this volcano, appear to be erupted at a major vent located in the centre of its top plateau. Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.21: Fairly fresh plagioclase-phyric lava from pancake like plateau at the northwestern tip of the southwestern plateau



Fig. 5.22: Petrographically similar plagioclase-phyric lava as in picture to the left. Note more pervasive groundmass oxidation

5.2 Rock sampling

The next two dredges aimed for the northern margin at different water depths. DR52 again aimed for the base between c. 3,600 and 3,400 m b.s.l. while DR53 is located beneath the edge from 2,900 to 2,400 m b.s.l. Besides sedimentary rocks and breccia DR52 returned only a single volcanic rock of a dense, highly plagioclase phyric (25-30%, up to 4 mm) lava that also contains c. 5%, 2 mm sized pyroxene crystals (DR52-1; Fig. 5.22). The groundmass still contains grayish fresh parts but is often oxidized to reddish-brown. The similarities to DR51 lavas are striking. DR53 further upslope again delivered only a few Mn encrusted pillow lava fragments and Mn-crusts. The lava is slightly vesicular and significantly less porphyric (5%, mm-sized plagioclase) than those of the two previous locations. The last dredge DR54 of the pancake plateau was carried out along its eastern margin (DR54) but returned only Mn-crusts and Mn fragments.

In summary, dredging operations at the southwestern plateau of the Mozambique Ridge during SO232 obtained samples from throughout the entire depth range and critical morphological units. The top region proved most difficult but at two places lavas were obtained including a fairly fresh plagioclase phyric variety (DR11). From the base of the plateau, plagioclase and olivine phyric lava as well as very fresh aphyric lava were obtained at DR15, DR21 and DR19 respectively, while a microcrystalline gabbro or dolerite was sampled at DR18. The northwest of the southwestern plateau houses a very large, circular lava plateau ("Pancake" volcano) that is mainly composed of plagioclase phyric basalts being suitable for age dating and a full range of geophysical analyses. Finally, a younger magmatic phase as evident from reflection seismic data has been sampled at DR14 that included fresh glass from chilled pillow margins.

5.2.2.2 Eastern margin of the Mozambique Ridge (DR29 - 44)

The eastern margin of the Mozambique Ridge is marked by a steep east facing morphological step of up to 2,000 m difference in elevation that separates the plateau edges at c. 3,000 m b.s.l. from the surrounding ocean floor at c. 5,000 m b.s.l. (Fig. 5.23). This linear feature stretches from c. 34°15'S to 32°20'S, where the slope starts to become significantly flatter, further north. In a regional context the main part of the eastern margin is part of the central plateau of the Mozambique Ridge, a huge circular structure that extends from 34° to 31°30'S. Its eastern margin is probably the trace of a fault scarp that could be a normal fault as those along the southern margin but that is additionally affected / overprinted by the "Andrew Bain" fracture zone (König and Jokat 2010) that runs c. 15 nm outboard and parallel to the eastern plateau margin (Fig. 5.23). Our dredging strategy aimed to extensively sample the eastern scarp over its entire length as densely as possible and at variable depth intervals.

DR29 is the southernmost sample location along the eastern boundary and sampled the east facing slope right beneath the plateau edge from c. 3,800 to 3,400 m b.s.l. (Fig. 5.24). It returned 1/8 full and contained three different lava lithologies. Lithology A (DR29-1, -2) comprises a nearly dense (<1% vesicles), plagioclase phyric (1-2%) lava with a fine grained greyish to slightly brownish groundmass (Fig. 5.25). The groundmass also contains microphenocrystic plagioclase needles. Lithology B (DR29-3 to -13) is a fine grained, dense, aphyric lava (Fig. 5.26). The freshest samples possess a grey matrix with minor Fe-hydroxide patches with the more altered samples becoming progressively more oxidized to brownish-green discolorations. Lithology C (DR29-14 through -16) is also aphyric but more intensely altered to light brown with 10-20% partially open vesicles. These rocks

could represent the flow top of lithology B. Lithology D was a single large bloc ($47 \times 37 \times 20 \text{ cm}^3$) similar to lithology C but with the vesicles being aligned in a circular fashion along the margins of the bloc. The absence of sediments in this dredge indicates that the upper part of the eastern plateau margin is made of lava flows.

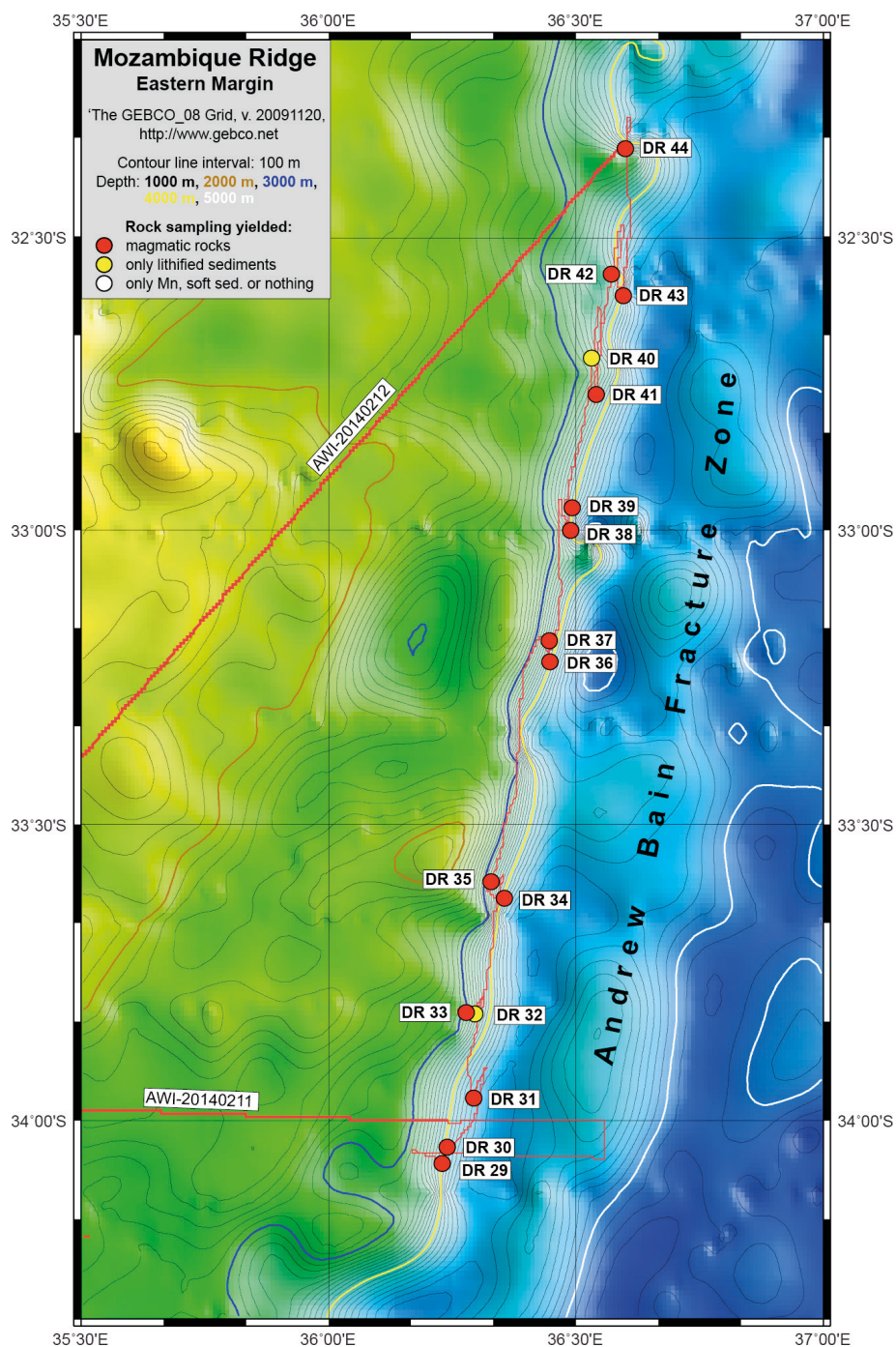


Fig. 5.23: Overview map showing the eastern margin of the Mozambique Ridge (based on "The GEBCO_08 Grid, version 20091120", <http://www.gebco.net>). Dots mark SO232 dredge stations and red lines the SO232 ship's track. Seismic profiles recorded on SO232 are marked by thick lines.

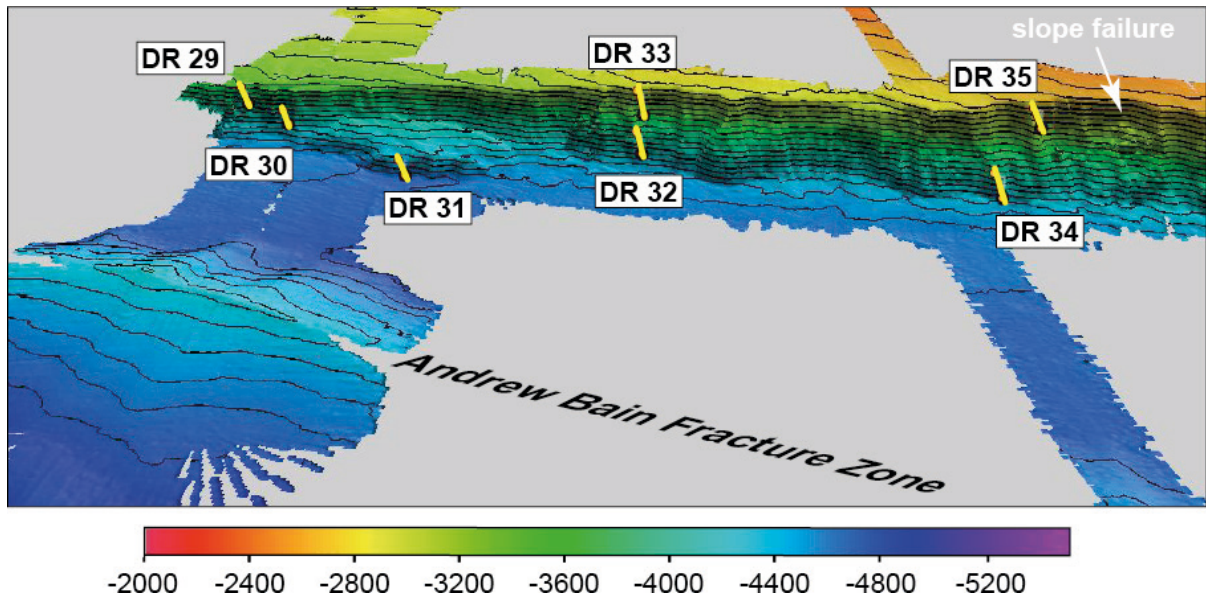


Fig. 5.24: 3D-map of the southern section of the eastern margin of the Mozambique Ridge with dredge stations DR29-34 (view from E to W). Note the smooth morphology of this section of the "Andrew Bain" fracture zone (in the foreground to the left), which hindered sampling of this feature. Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.25: Lava lithology A of DR29: a dense, plagioclase phyric lava



Fig. 5.26: Lava lithology B of DR29: a dense aphyric lava

DR32 c. 8 nm further north was located in the lower section of the east facing slope right beneath a break in slope at mid section. It returned Mn encrusted sediments and a large angular bloc of lithified sediments. Closer inspection could not doubtlessly reveal whether samples DR32-1 through -3 are of sedimentary or volcanic origin and thus require thin section inspection on shore. Until then it may well be that parts of the eastern plateau margin exposed here consist of solidified sedimentary rocks. For that reason DR33 was carried out 0.5 nm further upslope in

c. 3,500 to 2,950 m water depth. Although it recovered only two rocks, a solidified sedimentary rocks and a subangular, strongly altered (oxidized) vesicular basalt fragment, the presence of igneous material within the upper structural level of the scarp indicates that the sampled structure most likely belongs to the magmatic portion of the Mozambique Ridge that formed during the main plateau building phase. The lava fragment (DR33-1) is highly vesicular (25%, 1-3 mm) with mostly red clay filled vesicles along the outer rims, but vesicles in the center of the piece are open. The groundmass is fine grained with occasional feldspar needles (<1mm). The presence of an up to 1 cm thick Mn crust around the entire, subangular surface of the piece indicates that the lava bloc was eroded from a higher stratigraphic level before being deposited down slope some time ago.



Fig. 5.27: Highly plagioclase phyric lava



Fig. 5.28: Fairly fresh plagioclase phyric lava

The next dredge (DR34) aimed for the lower part of the eastern scarp between c. 4,300 and 3,900 m b.s.l. another c. 12 nm further north. Three rocks of two different lithologies, an angular lava fragment and a volcano-sedimentary breccia, were obtained. The lava fragment (DR34-1) is plagioclase phyric (5%, mm-sized) with the latter appearing accumulated on one side of the sample (Fig. 5.28). The groundmass is fairly fresh (light grey), fine grained and dense with some patches of Fe-oxyhydroxides and yellowish-green material that may be altered pyroxene. The volcano-sedimentary rocks (DR34-2 and -3) contain rounded volcanic material floating in a red-orange sedimentary (?) matrix. Further upslope in the same area DR35 was carried out at c. 3,200 m b.s.l. but got severely stuck after a few metres of dredging and therefore had to be pulled up near initial bottom contact. Still, it returned three Mn crusts that contained cm sized clasts of volcanic and sedimentary origin. Sample DR35-1A is a representative angular, strongly altered volcanic clast with a fine grained groundmass that contains mm-sized plagioclase microphenocrysts. The 5 cm thick Mn crust is represented by DR35-1B while the reddish sediment (DR35-2A) was sampled from the second Mn crust (DR35-2B).

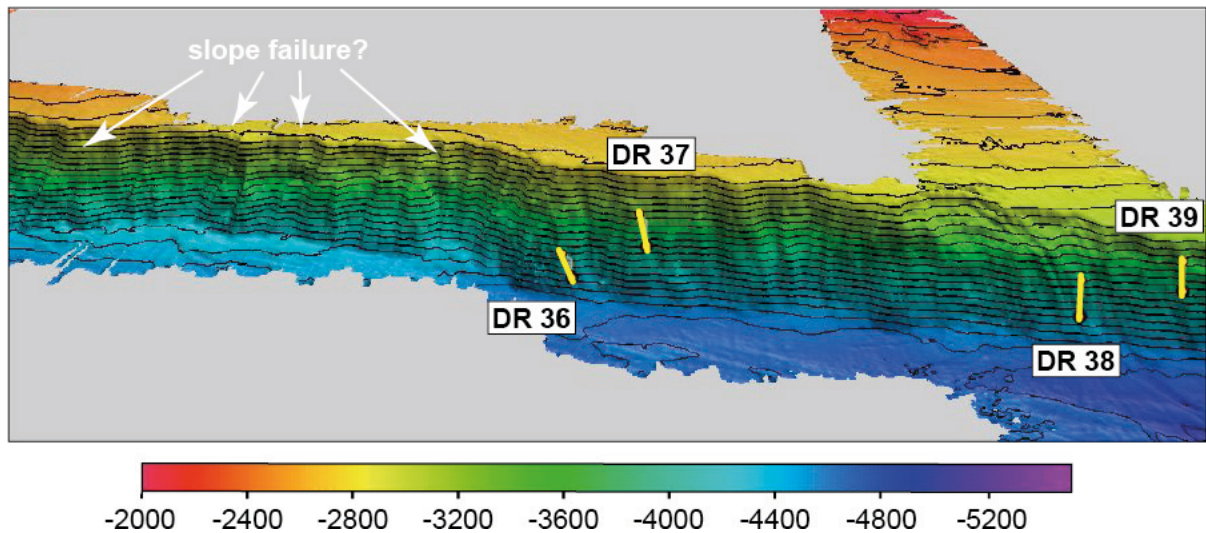


Fig. 5.29: 3D-map of the central section of the eastern margin of the Mozambique Ridge with dredge stations DR36-39 (view from E to W). Exaggeration, contours, and data sources as in Fig. 5.11.

Sonne headed c. 23 nm further north for the next dredge target (DR36) due to time constraints and because the stretch in-between appeared affected by several slope failures on the multibeam maps (Fig. 5.29). Track DR36 aimed for the lower section of a relatively smooth, steeply eastward dipping slope from c. 4,400 to 4,000 m b.s.l. and returned one box of lava fragments. Although represented by only a single sample (DR36-1), a plagioclase phyric (15% up to 4 mm) angular lava appeared to be the freshest and most suitable sample for age dating (Fig. 5.30). The most prominent lava type of this dredge is more dense with significantly less plagioclase phenocrysts (<10%) and a more altered / oxidized groundmass (DR36-2 through -6) due to higher abundance of small cracks. The third lava type (DR36-7 and -8) is aphyric with a microcrystalline groundmass consisting of plagioclase needles and small pyroxenes. Overall these samples appear more altered due to their pervasive brown groundmass discoloration. The next location (DR37) lies c. 3 nm further north and covers the middle part of the slope from c. 3,750 to 3,500 m b.s.l. It returned 3 large Mn encrusted breccias that contained numerous angular lava fragments along with smaller volcanic fragments. Of these a total of three petrographically different lava types were identified. Sample DR37-1 and -2 mark the first type of a medium altered lava with abundant vesicles (15%, up to 5mm) that are filled with manganese, Fe-hydroxides and most prominently blue-white material that could be calcedone. The matrix contains only minor, small plagioclase phenocrysts. The second lava type is overall similar to the first type but much less vesicular (<5%). The fine grained groundmass is strongly oxidized throughout and contains few fsp. microphenocrysts (<1mm). Samples DR37-3A to C are individual clasts from a Mn encrusted breccia while the other type 2 samples (DR37-4 to -6) are individual Mn encrusted clasts. The freshest lava fragments turned out to be sample DR37-7 with a grey to slightly brownish, fine grained groundmass that contains minor fsp. phenocrysts. Sample DR37-8A to C are again individual clasts from a Mn encrusted breccia. The lava fragments appear more densely fractured leading to an overall more advanced state of alteration.



Fig. 5.30: Sole sample of a highly plagioclase phyric lava in DR36



Fig. 5.31: Lava type A of DR38 with fine grained, aphyric groundmass. Note Mn filled vesicles

Approximately 12 nm further north DR38 aimed for the steep mid-section of the eastern slope between c. 4,300 and 3,750 m b.s.l. (Fig. 5.29) It returned 1/5 full with a bonanza of relatively fresh volcanics of at least 4 petrographically different lava types. Lava type A (DR38-1 through -11) is characterized by an aphyric texture with a fine grained groundmass consisting of interstitial feldspar needles and pyroxene (Fig. 5.31). Although the rock is essentially dense and despite the absence of thicker Mn crusts, the few mm-sized vesicles are filled with black material, which is probably manganese. These fillings need to be avoided when preparing the rocks for bulk geochemical analysis. The size and freshness of the groundmass feldspar need to be checked for possible feldspar separation for Ar-Ar age dating and Sr-Pb isotope analysis. Note that some samples of this group contain 1-5%, 1-5 mm-sized feldspar phenocrysts (for details see rock description table). Lava type B (DR38-12 through -23) is again aphyric but the groundmass is considerably coarser grained than in type A. The lava is also free of vesicles and most characteristically contains abundant tiny Fe-hydroxide spots within the groundmass and Fe-hydroxide fillings along < 1mm wide cracks. Size and freshness of groundmass microphenocrysts appear in favor for age dating and the overall quality for geochemical analysis seems fairly good. A unique lava type C was sampled with DR38-24 as this sample contains abundant (5-10%) large (~5 mm) feldspar phenocrysts (Fig. 5.32). The groundmass is free of vesicles but in large parts strongly oxidized giving the sample a strongly altered impression which probably has also affected the porphyritic feldspars. The most unusual lithology was, however, sampled in DR38-25 through -27 since sample -25 strongly resembles a volcanic bomb similar to those common for subaerial eruptions (Fig. 5.33). The interpretation that this sample is a volcanic bomb is mainly based on the observed bread-crust appearance of the outer surface. Overall this rock type has abundant (5%) filled (cc?) vesicles and a pervasively oxidized groundmass, which leaves the impression of limited geochemical use.

5.2 Rock sampling



Fig. 5.32 (top): Large >5mm sized feldspar in a strongly iron stained lava fragment of DR38



Fig. 5.33 (to the right): Bread-crust on top of the uppermost piece resembles those commonly found in volcanic bombs formed in subaerial eruptions

The next dredge targeted the mid-slope from c. 3,900 to 3,400 m b.s.l. at c. 2.5 nm north of the previous location. A 1/3 full dredge returned containing variably altered lava fragments ranging from fresh to moderately altered (Fig. 5.34). In principle the texture of the vast majority of samples taken from these dredge is dense with minor vesicles and a fine to medium grained groundmass. Differences exist in terms of feldspar phenocrysts that are up to several percent in samples DR39-8 and -11 through -24 for example. Sample DR39-27 differs from the rest as it contains abundant black, sub mm-sized minerals that could be pyroxene (Fig. 5.35).

DR40, carried out 15 nm further north, recovered only lithified mud stones from immediately below the plateau edge at c. 3,900 to 3,600 m b.s.l. (Fig. 5.36). The next attempt (DR41) was a few nm south of the previous location at greater depth (c. 4,250 to 3,900 m b.s.l.) below mid section of the slope and recovered 4 angular pillow lava fragments and a piece of breccia with volcanic clasts. The pillow lavas possess a coarse grained, moderately altered yellowish groundmass that contains up to 10%, mm-sized feldspar phenocrysts. All pieces have a thin Mn coating and sub mm wide cracks are filled with Mn and dendritic Mn growing from there into the groundmass.

Progressing further north, DR42 was placed along less steep dipping slope at c. 32°34'S from c. 4,300 to 3,800 m b.s.l. From here onwards the gradient in slope becomes significantly less steep than observed for the southern portions of the eastern scarp. DR42 returned a few rock fragments. In principle two variations are distinguished. The first is a fine grained, non vesicular rock without any clear indications whether it is of volcanic or sedimentary origin (DR42-1, -2). The others (DR42-3 to -5) are lava fragments with 2-5% Mn filled vesicles and an aphyric highly altered groundmass. Macroscopically the samples appear rather poor for geochemical and geochronological use. DR43 was carried out c. 4 nm south of DR42 in an area where the east facing scarp still has the steeper dip.

The track covered the lowermost part of the slope from 4,700 to 4,200 m b.s.l. and returned only 6 rocks. DR43-1, -3 are broadly similar, possess a fine grained groundmass with strong yellowish-brown staining and are free of any vesicles. Again it remained unclear whether volcanic or sedimentary rocks. DR43-2 is of clear volcanic origin with a red oxidized fine grained groundmass that houses 1% apparently altered fsp. phenocrysts (1-2 mm) and a few, mm-sized filled vesicles. Feldspar phenocrysts may be useful for age dating whereas bulk rock magmatic chemistry seems limited.

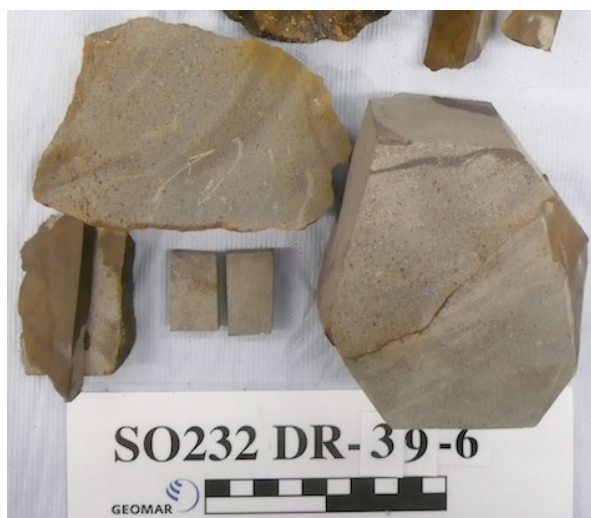


Fig. 5.34: Fairly fresh aphyric lava of DR39



Fig. 5.35: An unusual lava with abundant black phenocrysts that could be pyroxene.

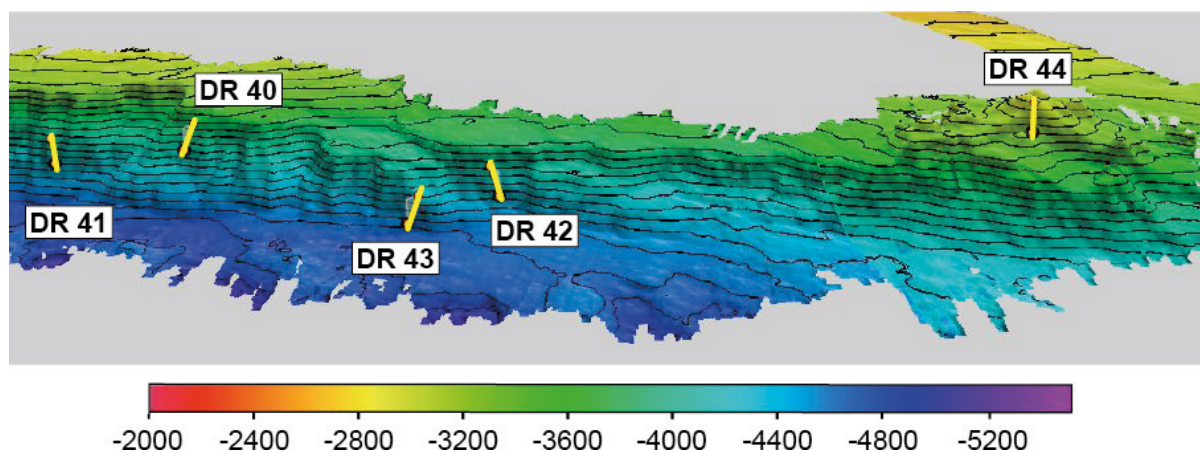


Fig. 5.36: 3D-map of the central section of the eastern margin of the Mozambique Ridge with dredge stations DR40-44 (view from E to W). Exaggeration, contours, and data sources as in Fig. 5.11.

The final dredge (DR44) along the eastern scarp was carried out within a small field of volcanic cones (c. 3,200 to 2,750 m b.s.l.), located right at the plateau edge indicating a possible relation to faulting that shaped the eastern margin of the Mozambique Ridge (Fig. 5.36). Notably no volcanic ridges or cones were observed over the entire length of the eastern scarp further south. Somewhat expected DR44 delivered a half full dredge of Mn encrusted yellowish-brown volcanoclastic material. Careful inspection revealed, however, one clast of volcanoclastics attached

5.2 Rock sampling

to a vesicular (40%, 2 mm, partially filled) lava fragments (Figures 5.37 and 5.38). Another lava fragment is described in DR44-2 with an aphyric, dense but totally altered groundmass that contains a few feldspar microphenocrysts. A more unusual rock was sampled in DR44-5x, a gneissic drop stone, covered in c. 1 mm Mn crust all around that must have been ice rafted from Antarctica during an earlier glacial episode.



Fig. 5.37: Vesicular lava fragment attached to volcaniclastic material



Fig. 5.38: Same vesicular lava fragment with volcaniclastics being cut off

In summary, dredging the central part of the eastern margin of the Mozambique Ridge during SO232 was highly successful and delivered igneous rocks in 14 out of 16 dredges. The magmatic rocks display large variations in terms of vesicularity ranging from dense to fairly vesicular as well as in terms of mineral texture ranging from feldspar phyric to aphyric with fine to coarse grained groundmasses. Most dredges obtained good quality material for age dating and geochemistry with some samples being unusually fresh considering the probably Early Cretaceous age of the structure. The possible occurrence of a volcanic bomb requires further volcanological investigation before subaerial volcanic activity can be safely confirmed. Evidence for a later phase of magmatism in connection with faulting along the eastern boundary comes from volcanic cones located on the eastern plateau edge in the north. Luckily vesicular lava was recovered from the totally altered volcaniclastics which may be useful to constrain the age and composition of this later volcanism.

5.2.2.3. Central plateau

The central plateau stretches from 34°S to 31°30'S and 34°E to 36°30'E, including its eastern margin. It comprises the shallowest portion of the Mozambique Ridge with some cones rising to 900 m b.s.l., but in general the main circular part of the high plateau area lies above the 2,000 m b.s.l. contour and consists of several large conical structures (Fig. 5.39). Multibeam bathymetry displays only a few ridges and cones with steep enough slopes for dredging. In addition, seismic reflection data obtained immediately prior to dredging revealed the presence of a thick

sediment cover in most places and very limited occurrences of magmatic basement exposures along faults or late stage extrusions cutting through the sediments. Having extensively sampled the base of the central Mozambique Ridge along its eastern margin, our sampling strategy focused on the top area of the plateau in order to include the presumably uppermost part of the volcanic succession.

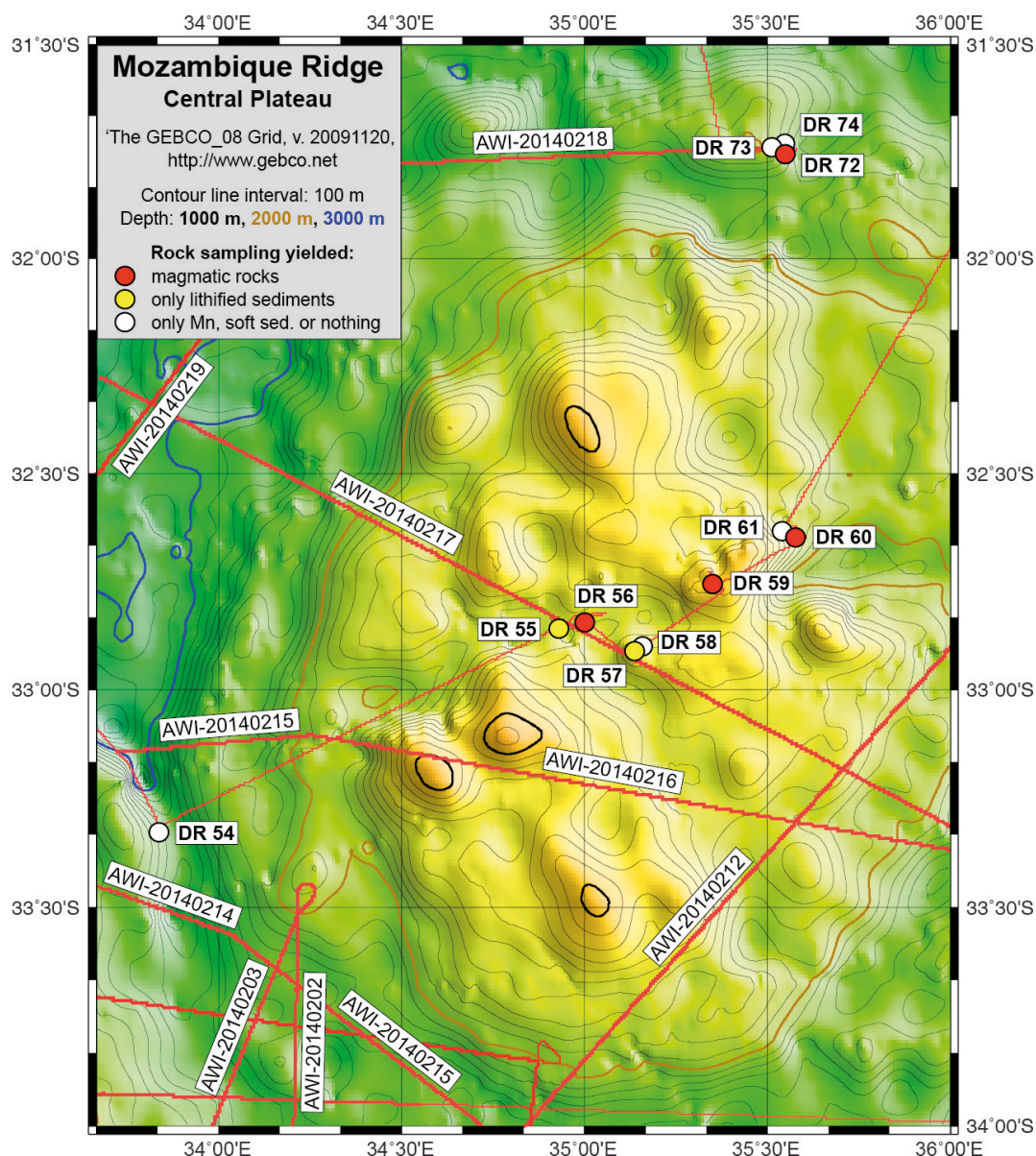


Fig. 5.39: Overview map showing the central plateau of the Mozambique Ridge (based on "The GEBCO_08 Grid, version 20091120", <http://www.gebco.net>). Dots mark SO232 dredge stations and red lines the SO232 ship's track. Seismic profiles recorded on SO232 are marked by thick lines.

Here, the first four dredges (DR55 through -58, Fig. 5.40) focused on two NE-SW trending ridges c. 10 nm apart from each other that are intersected by seismic reflection line AWI-20140217 (Fig. 5.39). The latter shows that the two ridges represent uplifted basement that is bounded by normal faults. DR55 returned only solidified brownish sediment and Mn-nodules from c. 1,570 to 1,340 m b.s.l. along the north facing flank of the ridge. DR56 located c. 4 nm east of DR55 returned ¼

5.2 Rock sampling

full with a few volcanics, abundant Mn crusts and nodules and lithified sediment. The two sampled lava fragments (Fig. 5.41) are both slightly vesicular (1-5%, partially Mn filled) and contain equal amounts of plagioclase and pyroxene phenocrysts (1-7%, 2-3 mm). The groundmass appears moderately to strongly altered with a greenish-brown discoloration. The sediments include solidified mudstone, breccias and Mn-nodules and crusts. The second NE-SW striking ridge was sampled at DR57 and -58 of which DR57 returned Mn crusts and solidified sediment from 1,550 to 1,300 m b.s.l. and DR58 a single Mn-nodule and a coral fragment from a similar depth range.

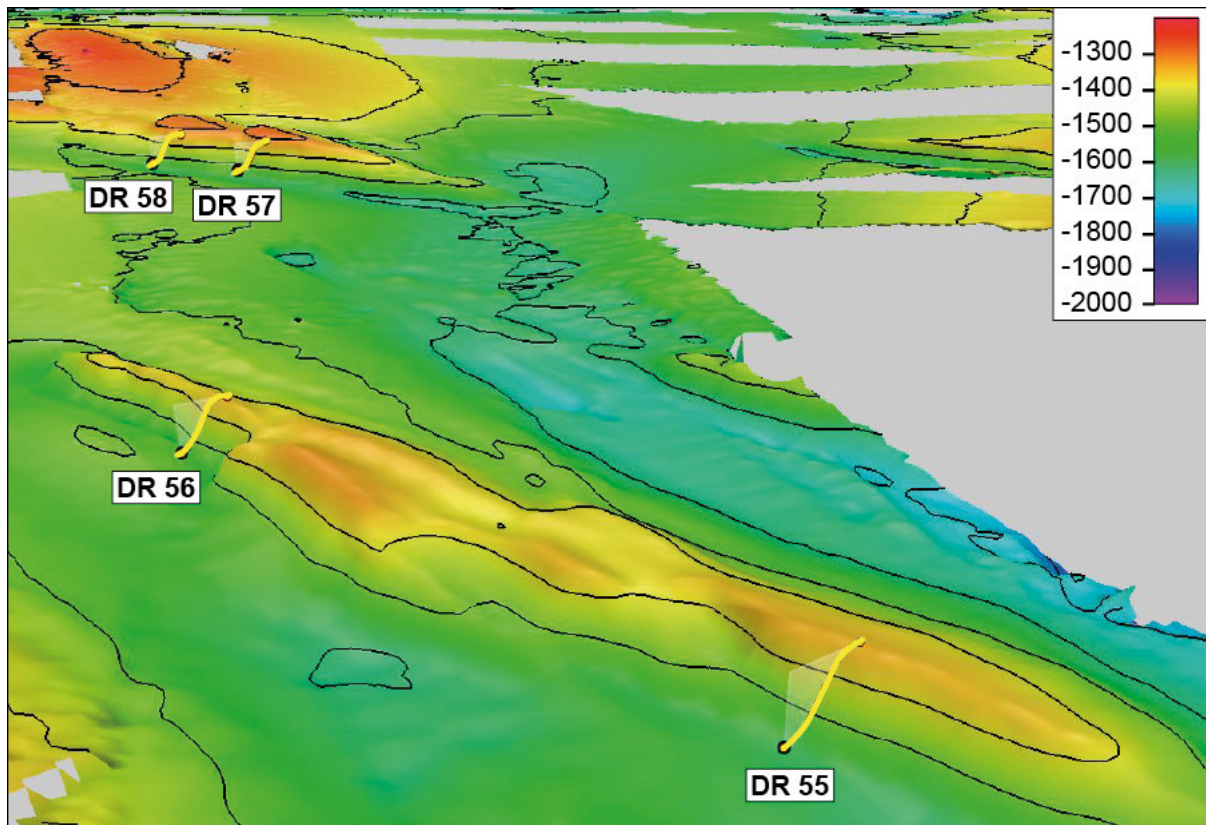


Fig. 5.40: 3D-map of the two ridges in the centre of the central plateau, which represent exposures of the plateau basement according to preliminary results of the SO232 seismic. Dredge stations DR55-58 are also shown (view from NW to SE). Exaggeration, contours, and data sources as in Fig. 5.11.

Further east, but still within the central plateau high, a small cone was mapped that rises to c. 900 m b.s.l. and thus marks the shallowest part of the central Mozambique ridge known so far (Fig. 5.42). Dredging turned out to be challenging as the cable got stuck on the ground c. 400 m away from the dredge, requiring skillful manoeuvring of the bridge officer to free the dredge at last (Fig. 5.43). Upon return, it was filled to one third with abundant volcanoclastic material that also contained two relatively fresh lava fragments (DR59-1 and -2). The latter are aphyric and highly vesicular (20-30%) with the vesicles being mostly filled with whitish material (cc?). The groundmass is grey and appears fairly fresh but the high vesicularity will make preparation of sufficient material for geochemical analysis difficult (Fig. 5.44). If fillings are calcite then leaching of 1-2 mm sized chips in HCl should be considered. The high abundance of volcanoclastic material

in this dredge indicates high degrees of fragmentation during eruption at relatively shallow water depths during this late stage magmatic event.



Fig. 5.41: Medium altered, slightly vesicular lava from northern of the two ridges in the top region of the central plateau

Further east DR60 and -61 were carried out at the tip of an east-west striking, V-shaped plateau that marks the eastern limit of the high plateau (Fig. 5.42). While DR61 only returned a few Mn-crusts, DR60 returned full despite a stuck dredge after 400 m of pulling the cable. Sample DR60-1 through -8 seem to belong petrographically to the same lava type, a plagioclase phyric (up to 10%, several mm), slightly vesicular to dense basalt (Fig. 5.45). Groundmass alteration ranges from entirely light grey fresh to more frequent reddish oxidized patches to pervasive brownish alteration. The quality of the plagioclase phenocrysts appear suitable for Ar/Ar dating but preservation and petrographic context need to be carefully evaluated. Sample DR60-9 is an exception, because in addition to 5-10% plagioclase phenocrysts, it also possesses 2-3% light green magmatic minerals that are probably pyroxene and/or olivine. Another unique sample is DR60-10, a rounded cobble with a dark grey, fine grained, aphyric matrix that did not reveal any igneous texture under the hand lens or binocular microscope. Thin section must be checked to decide whether this sample is indeed of sedimentary origin or not. Other suspect sedimentary textures are present in DR60-13. Sediments in this dredge include a light brown to beige carbonate breccia (DR60-11), a dark green brecciated rock (DR60-12, -16) and Mn-nodules (DR60-17, -18).

5.2 Rock sampling

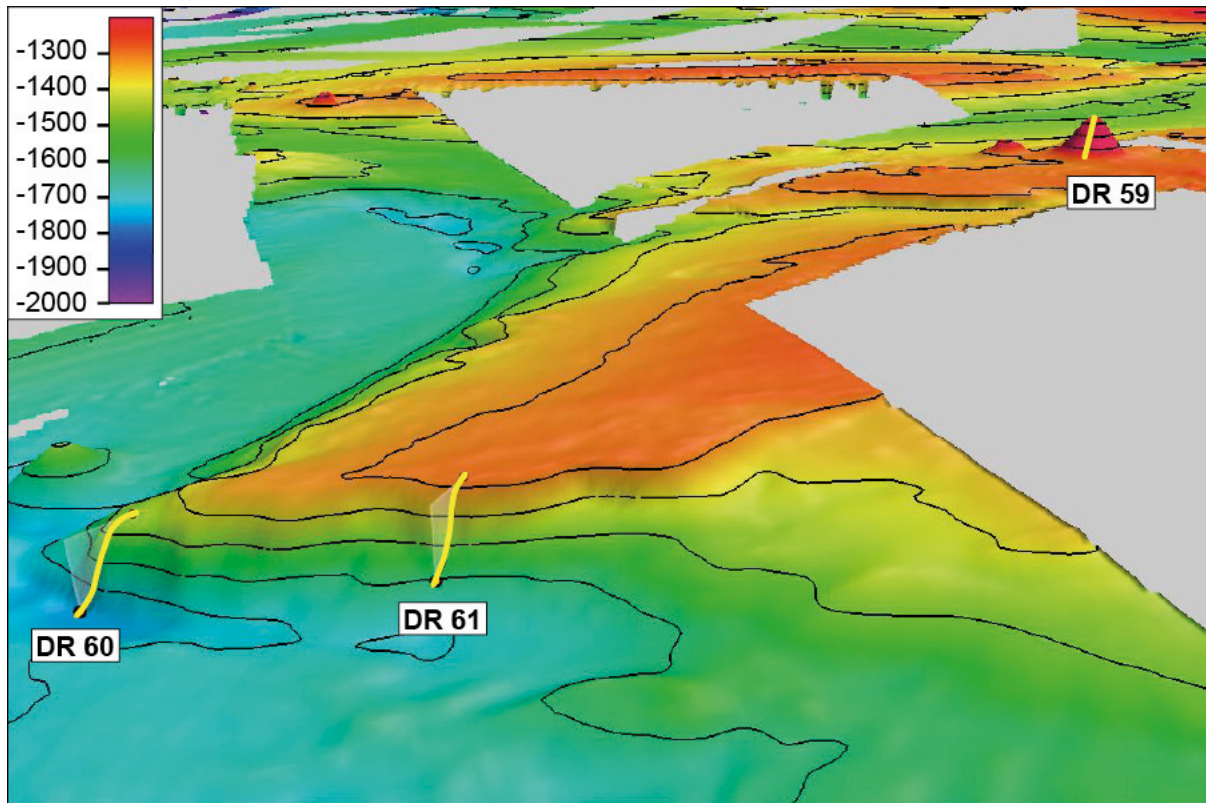


Fig. 5.42: 3D-map of the northeastern top region of the central plateau showing the sites of dredge hauls DR59 at a small volcanic cone and DR60 and 61 at a V-shaped plateau (view from NNE to SSW). Exaggeration, contours, and data sources as in Fig. 5.11.

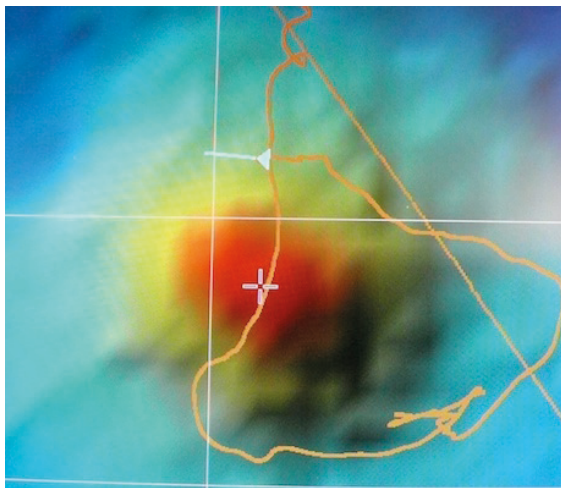


Fig. 5.43 (top): Southward dredge track DR59 and complex ship maneuvering after cable got stuck c. 400m away from dredge.



Fig. 5.44 (to the right): Vesicular lava fragment with attached volcanicalstic material from the late stage cone.



Fig. 5.45: Plagioclase phyric, fairly fresh lava from northeastern margin of high plateau region

The final structure to be sampled within the central plateau was a c. 20 km long, E-W striking ridge at its northern margin ($31^{\circ}45'S$, $35^{\circ}33'E$) that is composed of numerous volcanic cones (Fig. 5.46). As the morphology of this ridge appears truly volcanic and seems free of a thick sedimentary cover it probably formed during a later volcanic event after the main plateau phase. See seismic profile AWI-20140218 for potential contact relations between sedimentary rocks and magmatic basement further west.

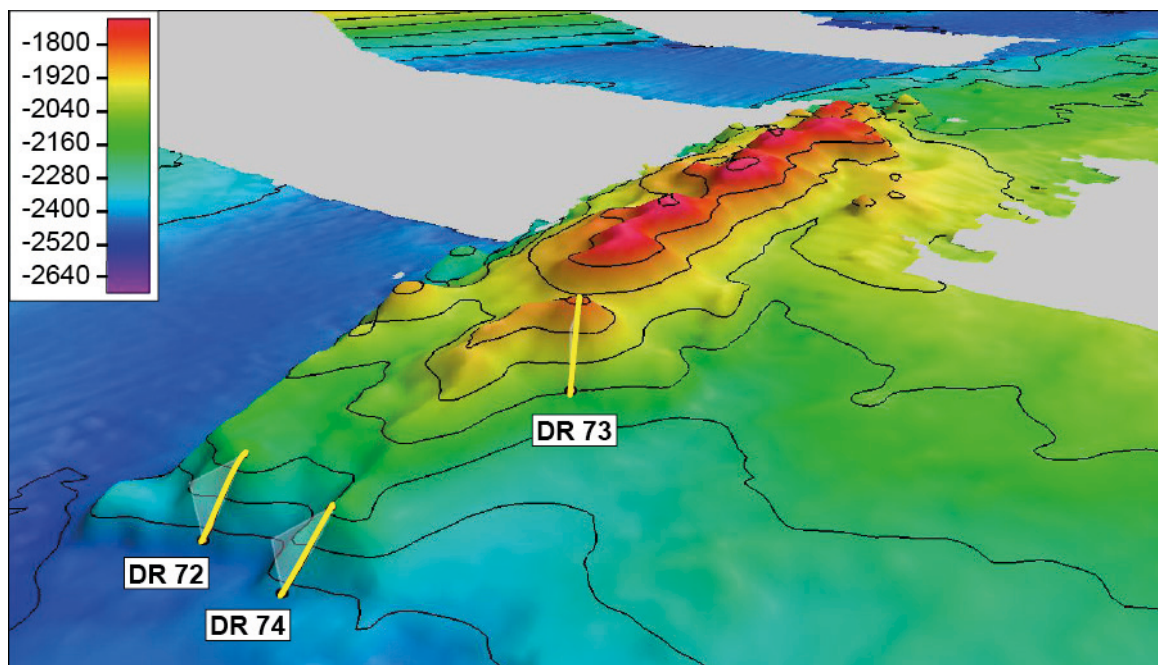


Fig. 5.46: 3D-map of the E-W striking volcanic ridge at the northern margin of the central plateau showing the sites of dredge hauls DR72-74 (view from NE to SW). Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.47: Vesicular, slightly pyroxene-olivine phyric lava from the base of the volcanic ridge at the northern margin of the central plateau. Note attached yellowish-green volcanicalstic material



Fig. 5.48: Yellowish-green volcaniclastic material with highly vesicular, matrix supported lapilli

Due to bad weather conditions only westward directions were possible for dredging and thus limited operations to the eastern end of the volcanic ridge. While DR73 from the top region (c. 2,050 to 1,835 m b.s.l.) of one of the cones returned only a single Mn-crust and DR74 from the eastern base returned empty, DR72 c. 0.5 nm south of DR74 returned lava fragments, volcaniclastics and Mn-crusts from c. 2,500 to 2,150 m b.s.l.. The lavas (DR72-1, -3 and -4) are subangular, Mn-encrusted, pillow fragments that are sometimes in contact with yellowish volcaniclastic material (Fig. 5.47). The pillow lava is vesicular (30%, up to 3 mm, partially filled) and contains c. 1% olivine and pyroxene phenocrysts. A second lava type is represented by DR72-2 with a pervasive reddish groundmass oxidation and Fe-hydroxide filled vesicles but dark green, crystalline phenocrysts or vesicle fillings. At this stage it remained unclear whether these dark green minerals are of primary magmatic or secondary origin. The volcaniclastic material contains abundant, matrix supported, highly vesicular lapilli (DR72-5, -6; Fig. 5.48). The final lithology of DR72 is a white-reddish, brecciated carbonate.

In summary, dredging of the top area of the central plateau proved difficult due to its smooth morphology, thick sediment cover, limited occurrences of magmatic basement outcrops. Five out of 10 dredge hauls conducted in this area delivered igneous rocks. Fortunately, at least one dredge at each of the sampled structural features was successful. Sampling of two small basement ridges in the central part of the top area yielded vesicular, feldspar and pyroxene phyric lava fragments, the dredge at the volcanic cone further northeast returned fairly fresh, vesicular lava fragments. Fairly dense lava clasts have been recovered from a V-shaped ridge-like feature in the northeast of the top area and at least two different lava types were dredged at a volcanic ridge on the northern margin of the central plateau, among them vesicular olivine and pyroxene phyric lava. We consider this relatively

broad range of igneous rocks recovered from the central plateau as a good basis to gain new insights into the latest stage of the plateau formation and possibly also younger episodes of magmatic activity at the Mozambique Ridge.

5.2.2.4 Northern plateau

The northern plateau is separated from the central plateau by a broad E-W striking depression between 31°12'S and 31°30'S (Fig. 5.49). It stretches from 34°50'E to 36°40'E with the steepest slopes occurring along the southern and eastern margins. The top region lies above the 2,000 m b.s.l. contour and is again composed of several very large conical structures that rise to c. 1,700 m b.s.l., but their morphology is overall significantly flatter than observed at the southern and central plateaus. A morphological exception occurs along the eastern margin where a c. 110 km long, N-S trending ridge is separated from the northern plateau margin by a linear depression. The eastern margin of this ridge dips steeply into the abyssal plain where it intersects with the trace of the N-S striking "Andrew Bain" fracture zone (König and Jokat 2010). Prior to SO232 only two dredges were carried out during SO183 within the area of the northern Mozambique Ridge (Fig. 5.49). These are DL5 at the aforementioned N-S trending ridge that provided continental shifts and DL0 at the southern plateau margin which gave extremely altered basalts and crusts. SO232 explored the northern plateau by dredging only (no seismic survey was run) and concentrated on the southern and eastern margins in order to test for its volcanic origin and the presence of a transform fault bounded continental raft along its NE margin.

The first three dredges (DR62 to -64) were carried out at the SE corner along east facing slopes at variable depth intervals from c. 4,550 to 2,500 m b.s.l.. In contrast to the predicted bathymetry the actual multi-beam mapping revealed a rather gentle development of a fairly smooth dipping southern slope into a moderately steep eastern margin that consists of at least two morphological steps (Fig. 5.50). DR62 sampled the lowermost part (4,550 to 4,000 m b.s.l.) and returned several lava fragments, some as cores of Mn-nodules (DR62-4) or within Mn-coated sediment clasts (DR62-5). In addition, various lithified sediments ranging from mud stones to breccias occurred. Samples DR62-1 to -4 appear petrographically similar and are nearly aphyric lava fragments with very minor vesicles (<1%) and a few plagioclase phenocrysts (Fig. 5.51). The groundmass is fine grained and grayish fresh in the first two, angular samples and becomes progressively more oxidized in the other two, more rounded samples. A more plagioclase phyric (1-2%) variety is sampled by an angular lava clast that occurred within a yellowish brown, Mn-encrusted sedimentary fragment. So, not only based on petrography but also on angularity and lithological context the dredge has sampled a variety of lava flows that underwent variable stages of erosion and alteration. The next two dredges were carried out c. 25 nm further north along the east facing slope from c. 3,440 to 2,820 m b.s.l. (DR63) and from c. 2,900 to 2,500 m b.s.l. (DR64). DR63 exclusively recovered Mn-nodules with 1-3 cm thick crusts that possess fairly large lava and sediment cores that appear mostly well preserved and suitable for further investigations. Samples DR63-1 to -5 are plagioclase phyric (5-10%, mm-size) lava fragments with a dense, fine grained groundmass that ranges from slightly altered to strongly oxidized (Fig. 5.52). Fresh olivine phenocrysts are observed in the first two samples. Mn-nodules with sediment cores were sampled from DR63-7 to -13, while DR63-6 is a suspect, aphyric vesicular volcanic rock. DR64 recovered only a few pieces of semi consolidated, yellowish medium grained sediment that is encrusted by c. 2 cm of Mn.

5.2 Rock sampling

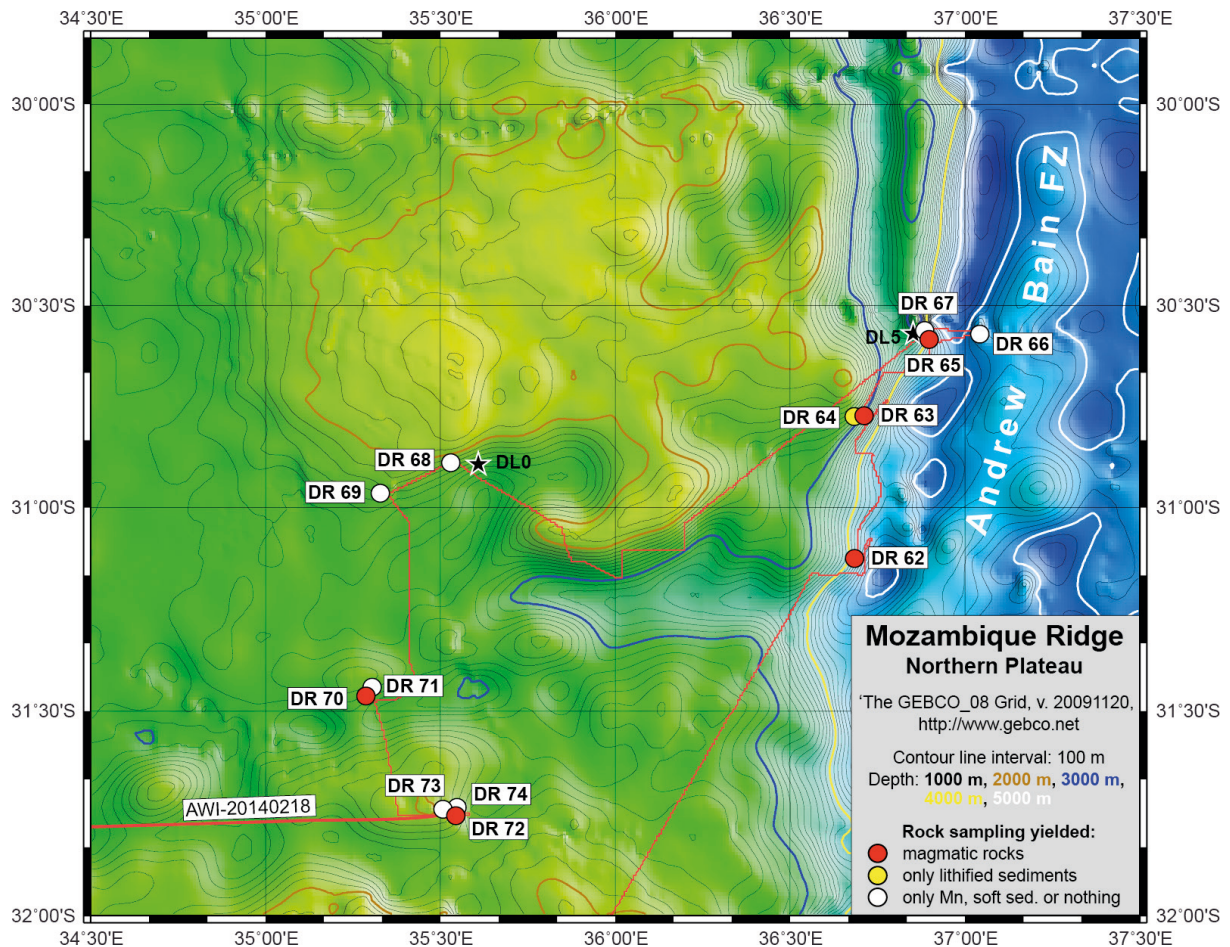


Fig. 5.49: Overview map showing the northern plateau incl. the transition area to the central plateau and a section of the "Andrew Bain" fracture zone east of the ridge (based on "The GEBCO_08 Grid, version 20091120", <http://www.gebco.net>). Note the distinct, N-S striking ridge directly off the eastern plateau margin which represents a continental bloc. Dots mark SO232 dredge stations and red lines the SO232 ship's track (for description of DR72-74 see chapter 5.2.2.3). Seismic profiles recorded on SO232 are marked by thick lines.

The N-S trending ridge of suspect continental origin was dredged near its southern tip along its steep east facing slope (Fig. 5.53). DR65 aimed for the base from c. 5,050 to 4,400 m b.s.l. and recovered only a few rocks mainly because a very large piece of shists (?) blocked the entrance of the dredge. The other rocks were Mn-nodules with igneous or metamorphic cores and a large, medium sized Mn-encrusted angular piece of gneiss (DR65-1). This very fresh gneiss has fairly dark grey color with a 1-2 mm spaced foliation of plastically deformed feldspars and dark minerals which could be pyroxenes or amphiboles (Fig. 5.54). The rock could be either a deformed plutonic or a high grade metamorphic basalt (amphibolite). Thin section inspection should not only identify mineral association but also check for accessory minerals suitable for U-Pb dating as the rock may reveal a complex evolution that may be linked to specific crustal terranes in Southeast Africa. The petrographically most complex rock of the dredge is DR65-2 which has a fine to medium grained texture that appears igneous and consists of plagioclase and reddish oxidized minerals (Fe-hydroxide) but lacks any indications for a foliation (Fig. 5.55). Most intriguingly the rock is dissected by parallel, grey bands that are

aphyric and range from a few mm to 1 cm width. It is unclear whether these grey stripes are of sedimentary origin (e.g. alternating sand layers of different grain size) or of magmatic origin such as layering of minerals during differentiation or infiltration of the grayish material into a micro gabbroic rock or simply reflect alteration. Samples DR65-3A through 6 are cores of Mn-nodules that are probably of metamorphic origin as indicated by thin (<0.1 mm) black minerals that could be biotite and give the rocks a pseudo foliation with a 1 mm spacing. DR65-7 seems to be a marble with mm-sized grey and white stripes while DR65-8 resembles a pegmatite that underwent plastic and brittle deformation (Fig. 5.56). The other dredge carried out further upslope (DR67, c. 4,030 to 3,360 m b.s.l.) returned only a Mn-crust. In summary, there is now growing evidence (SO183-DL5 and SO232-DR65) that the N-S trending ridge along the northeastern margin of the Mozambique Ridge represents a continental crustal bloc that was sheared off into the ocean basin during the initial opening of the southeastern Indian Ocean by transform faulting. An attempt to sample parts of this transform fault was made at DR66 (c. 4,800 to 4,570 m b.s.l., Fig. 5.53) where a N-S striking abyssal hill occurs c. 10 nm east of the continental ridge near the intersection with the "Andrew Bain" fracture zone (König and Jokat 2010). Unfortunately the dredge only returned Mn-encrusted sedimentary rocks.

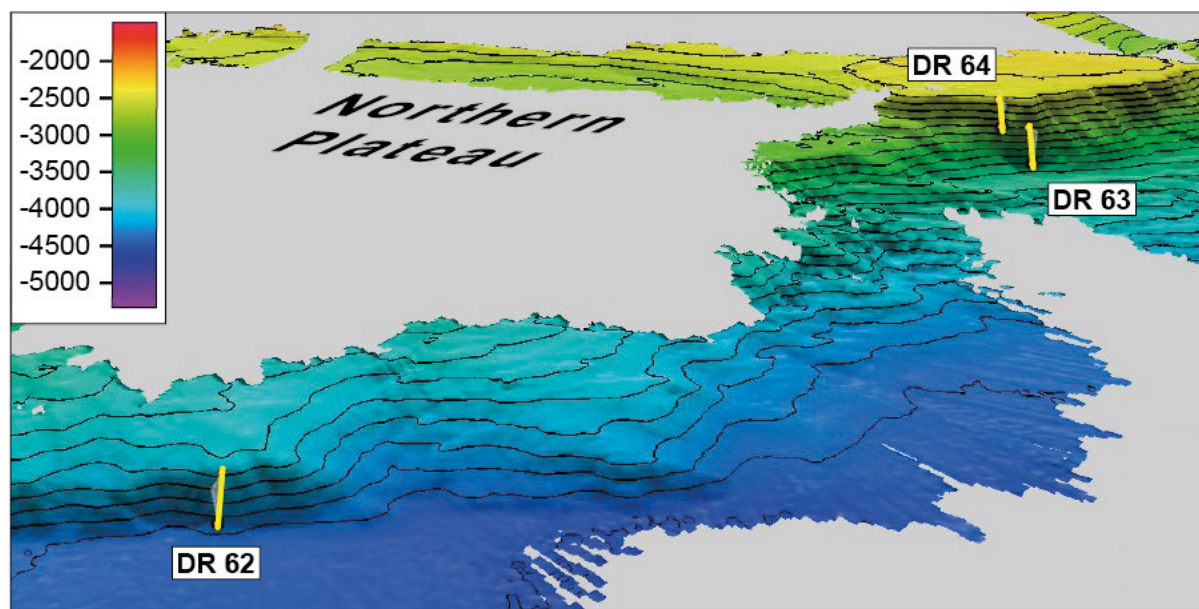


Fig. 5.50: 3D-map of south-eastern margin of the northern plateau showing the sites of dredge hauls DR62-64 (view from SE to NW). Exaggeration, contours, and data sources as in Fig. 5.11.

5.2 Rock sampling



Fig. 5.51 (to the left): Aphyric dense lava from the SE corner of the Northern Mozambique Ridge



Fig. 5.52 (below): Plagioclase phyric lava fragment forming the core of a Mn nodule

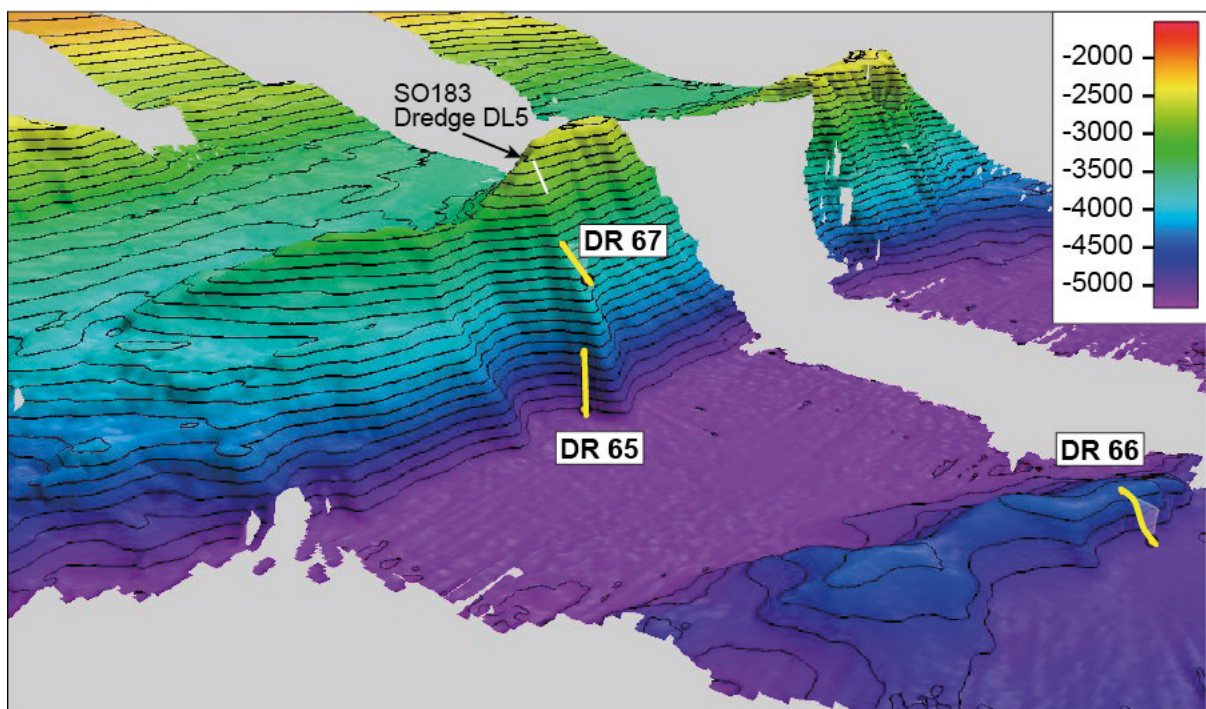


Fig. 5.53: 3D-map of the southern tip of the N-S trending continental bloc off the eastern plateau margin. The small ridge-like feature in the foreground on the right hand side most likely represents a fault zone related to the "Andrew Bain" Fracture Zone, which is located a few nm further to the east (not shown in this map, c.f. Fig. 5.49). Also shown are the sites of dredge hauls DR65-66 as well as SO183 dredge DL5 (view from SE to NW). Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.54 (to the left): Fresh continental gneiss with mm sized foliation along which bright feldspar and black minerals (amphibole? or pyroxene) are elongated and plastically deformed



Fig. 5.55 (above): Fine grained microcrystalline rock with suspect aphyric grey bands that cut parallel through the orange-brown matrix

Fig. 5.56 (to the left): Pegmatitic core of a small Mn nodule

The southern margin of the northern plateau was then mapped in a westward oriented survey but did not reveal any promising targets despite the steep south facing slopes in the predicted bathymetry. DR68 and DR69 were carried out near the SW corner of the Northern Mozambique Ridge where DL0 of SO183 obtained extremely altered basalts (Fig. 5.57). Still the two attempts of SO232 returned empty. The final structure of the northern area lies in the transition zone of the northern plateau to the central plateau and was carried out along a south facing slope from c. 3,050 to 2,400 m b.s.l. (DR70). It returned only three rocks but two of volcanic origin. They are medium to strongly altered aphyric basalts with 10-30% filled vesicles (Fig. 5.58). The other dredge carried out further up slope (c. 2,600 to 2,280 m b.s.l.) returned empty.

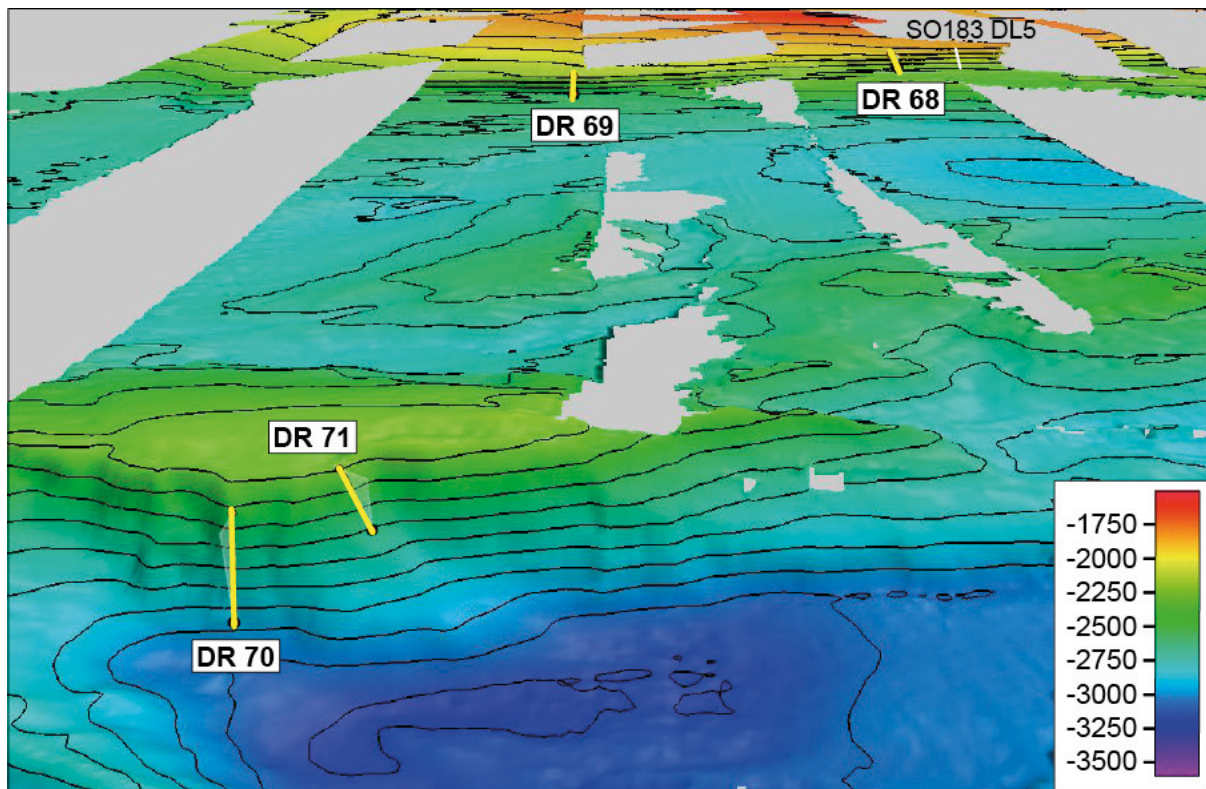


Fig. 5.57: 3D-map of the central section of the southern margin of the northern plateau with dredge sites DR68-71 and SO183 dredge DL0. Note the smooth morphology of the plateau and its margin (view from S to N). Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.58: Medium to strongly altered aphyric lava with abundant vesicles from the transition between the northern and central plateau of Mozambique Ridge

In summary, dredging of the eastern margin of the northern plateau and at the N-S trending bloc directly east of the margin was successful. A variety of lava fragments from the plateau margin, among them fresh dense rocks and feldspar-aphyric varieties, may provide information on the older, lower successions of the northern plateau. Furthermore, SO232 sampling confirmed the continental nature of the N-S trending bloc as it was already previously suggested by SO183 dredge DL5. We failed, however, to return rock samples from the ocean crust off the

plateau margin and only one of four dredges conducted in the top region of the northern plateau delivered igneous rocks. The altered, aphyric but fairly vesicular lava fragments out of that dredge may provide information on the magmatism in the transition zone between the northern and central plateau but require very careful preparation in the home labs.

5.2.2.5. Northwestern margin of Agulhas Plateau

During transit to Cape Town a c. 40 hour bathymetric, seismic reflection and dredging survey was run along the northwestern margin of the Agulhas Plateau in order to gather critical background data for IODP proposal 834. Predicted bathymetry displays a lobate northwestern plateau margin running along the 4,000 m contour with several cones near the plateau edge that reach above 3,000 m b.s.l. (Fig. 5.59). Our dredging strategy was to obtain hardrocks from all visible structural features seen in the EM120 survey maps. These include a diffuse and relatively flat, volcanic (?) plateau at the end of survey line AWI-2014032 (DR85), the presumed northwestern plateau edge (DR86) and an E-W striking ridge in the western half of the survey area that consists of several cones which may document a later magmatic phase (DR87). Due to weather and current conditions dredging directions were limited from 240° to 320°.

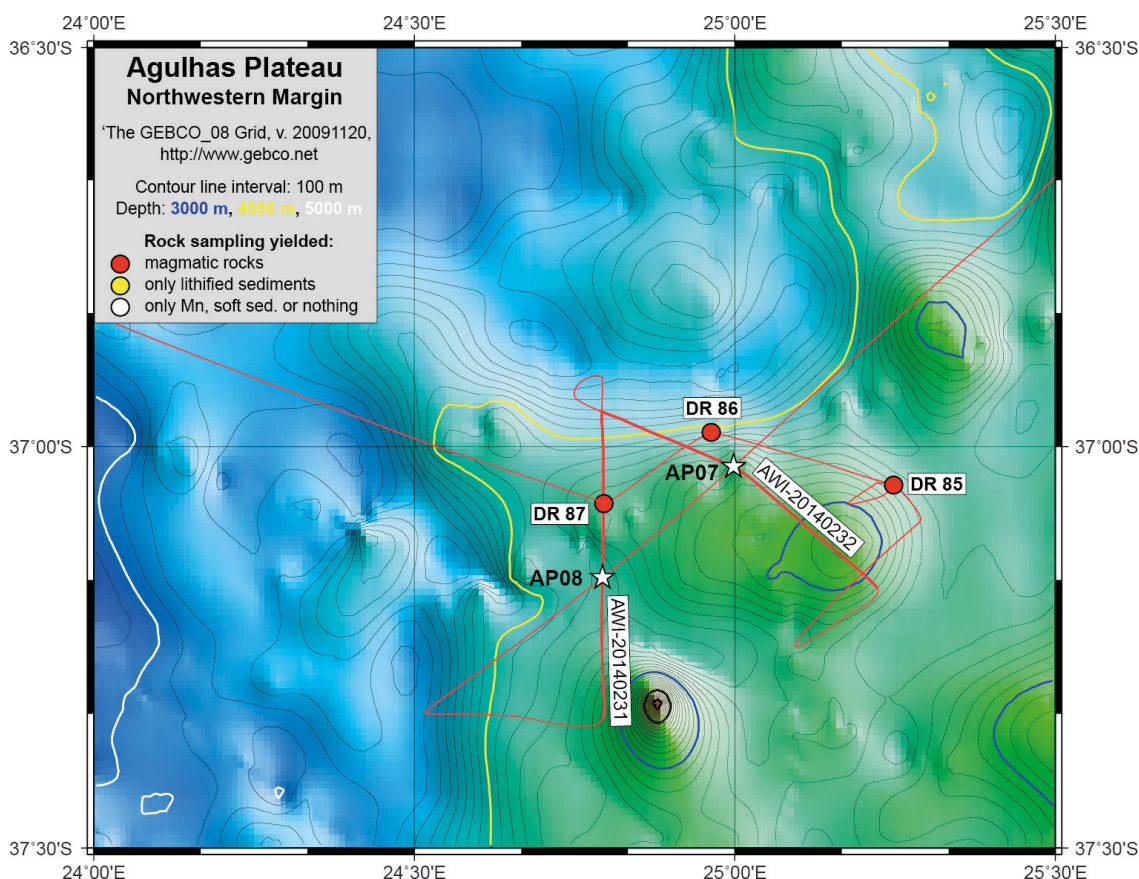


Fig. 5.59: Overview map of the northwestern margin of the Agulhas Plateau (based on "The GEBCO_08 Grid, version 20091120", <http://www.gebco.net>). Dots mark SO232 dredge stations and red lines the SO232 ship's track. Seismic profiles recorded on SO232 are marked by thick lines. The seismic lines cross the two proposed IODP drill sites AP07 and AP08 (white stars).

5.2 Rock sampling

The first site (DR85) ran from c. 3,500 to 3,300 m b.s.l along the shallow dipping northern flank of small cone that is part of the flat bathymetric feature that is made of numerous cones (Fig. 5.60).

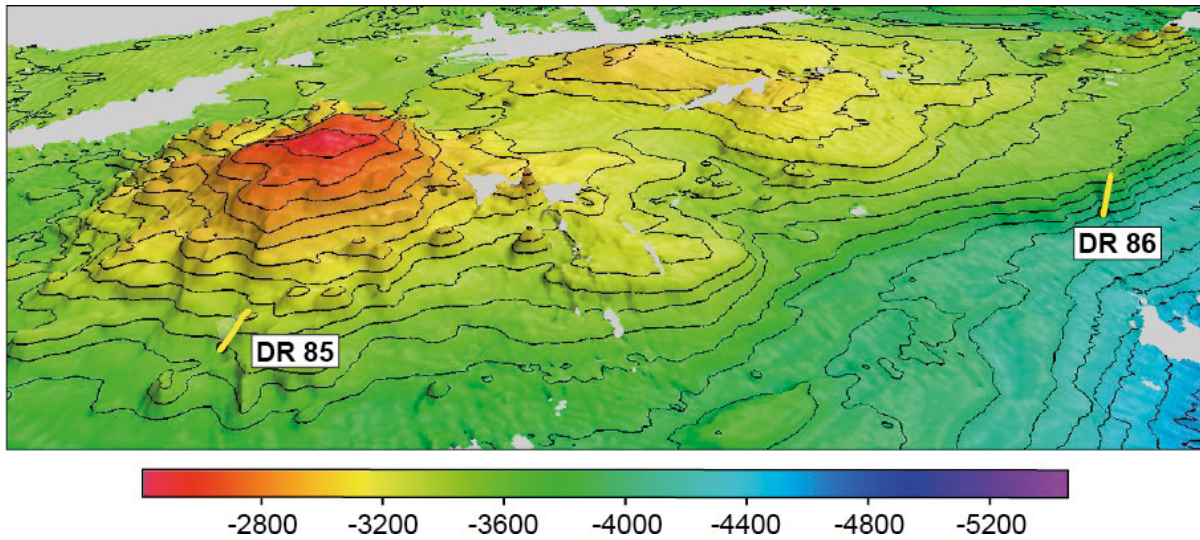


Fig. 5.60: 3D-map of a section of the northwestern margin of the Agulhas Plateau with dredge sites DR85 and 86 (view from NNE to SSW). The third dredge haul at the Agulhas Ridge, DR87, has been carried out at the cone chain visible in the background (upper right corner, see also Fig. 5.63). Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.61: Small, fairly fresh olivine-phyric lava from flat lava plateau near end of seismic survey line AWI-2014032



Fig. 5.62: Cores of Mn nodule consisting of volcanoclastic material. Recovered at northwestern plateau margin of the Agulhas Plateau

The dredge at the cone returned a few rocks of small lava fragments, lithified sediment, Mn-nodules and crusts. The two lava fragments (DR85-1, -2; Fig. 5.61) are olivine-phyric (5%, 1-5 mm, altered) with a slightly vesicular, fresh grayish groundmass. Both pieces possess a thin Mn-coating but the freshness of the groundmass permits further geochemical analysis though the size of the pieces is a limiting factor. The two sediment samples are extremely fine grained dark grey and beige mud stones.

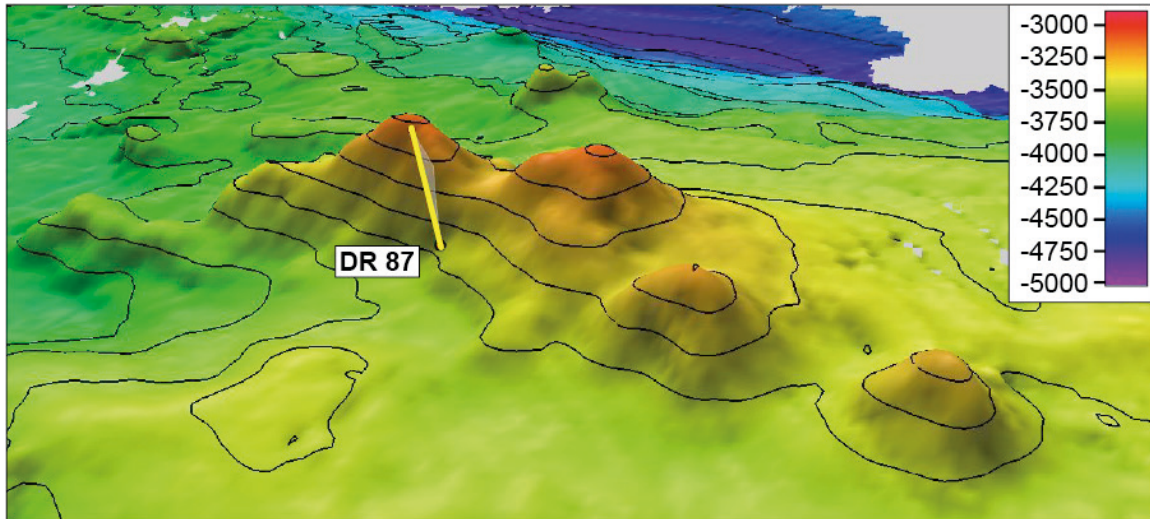


Fig. 5.63: 3D-map of a chain of volcanic cones on the northwestern margin of the Agulhas Plateau with dredge sites DR87 (view from SSE to NNW). Exaggeration, contours, and data sources as in Fig. 5.11.



Fig. 5.64 (to the left): Medium to strongly altered, vesicular lava from E-W striking ridge on the Agulhas Plateau

Fig. 5.65 (below): Spectacular large tooth in Mn-crust



DR86 located at the northern plateau margin recovered only two Mn-encrusted rocks from c. 4,000 to 3,640 m b.s.l. The angular cores of the Mn-nodules consist of a very strongly altered, aphyric, dense lava fragment (DR86-1) and yellowish, volcanoclastic material (Fig. 5.62). The lava contains 3-5%, 0.5 mm sized plagioclase microphenocrysts that may be useful for dating but the remainder of the samples is of limited use for magmatic geochemistry.

The final station of SO232 marks DR87 below the summit of a cone at the E-W striking ridge along its south facing flank from c. 3,500 to 3,200 m b.s.l. (Fig. 5.63). The dredge returned ¼ full large Mn-crusts, Mn-encrusted lava and sediment. The lava is highly vesicular (30%, mostly filled with green or white material) with an aphyric groundmass that is strongly altered to a brown discoloration (DR87-1, -2; Fig. 5.64). The sediments include a reddish, clast supported breccia (DR87-3) with the clasts being sub-cm sized, extremely altered lava fragments. The other sediment is a yellowish-white carbonate with abundant bore holes, filled with Mn. One of the Mn-crusts contained a spectacular large tooth of presumably a shark (DR87-5A; Fig. 5.65). In summary, the reconnaissance dredging survey of the northwestern margin of the Agulhas Plateau delivered lava in all three locations that show variations in petrography (olivine-phyric and aphyric), vesicularity (dense to highly vesicular) and degree of alteration (fairly fresh to extremely altered). There are good chances to obtain useful geochemical and possibly geochronological information on a few selected rocks.

5.2.2.6. Rock sampling summary and outlook

Sonne cruise SO232 has achieved the major goals of its dredge program, i.e. a representative hard rock sampling of all major geomorphological units of the Mozambique Ridge as well as adjacent features. Of the 59 dredges carried out in only 15 working days during SO232, 35 recovered magmatic rocks, 16 volcanoclastics, 25 sedimentary rock, and 26 Mn-Fe oxides. The broad variety of magmatic and sedimentary rocks recovered on SO232 represents by far the most detailed marine sampling of the Mozambique Ridge to date. Aphyric and feldspar-bearing sheet and pillow lavas dominate among these rocks, but various types of volcanoclastic rocks are also very common, some of them show textures or structures, which may point to subaerial or shallow water volcanic activity and/or deposition. Minor lithologies include, among others, olivine-phyric lava, plutonic rocks, and coarse-grained igneous rocks representing most likely subvolcanic intrusives. The overall degree of alteration of the recovered rocks varies from strongly altered to surprisingly fresh, even fresh glass rims are preserved in a few samples. Although alteration is a well-known problem for geochemical analysis and dating of magmatic rocks due to their extended exposure in a submarine environment over several 10th of millions of years, we are confident that SO232 yielded a comprehensive set of samples being suitable for shore-based analyses including advanced methods of Sr-Nd-Pb-Hf isotope and Ar/Ar dating.

SO232 recovered magmatic rocks from the base and the top region of the southwestern and central plateaus of the Mozambique Ridge as well as from the basis of the northern plateau and the transition area between the northern and the central plateau. Only the top area of the northern plateau could not be sampled successfully due to its smooth morphology and thick sediment cover. Additional sampling attempts have been carried out at the "Andrew Bain Fracture Zone" and at a bloc of the northeastern margin of the Mozambique Ridge where a previous dredge (SO183) recovered continental rocks. Whereas sampling of the fracture

zone failed most likely due to smooth morphology and thick sedimentary cover, the SO232 dredges at the bloc recovered plutonic and metamorphic rocks supporting the hypothesis that this bloc represents a continental fragment. Remarkably plutonic and metamorphic rocks with continental affinity were found exclusively at that bloc and in rare cases as dropstones. This confirms previous studies (e.g. Gohl and Uenzelmann-Neben, 2001, König and Jokat, 2010) that at least the major portion of the Mozambique Ridge is volcanic in origin. With the SO232 samples at hand it is now possible to constrain the magmatic evolution of the Mozambique Ridge in terms of age and composition in more detail. Did the ridge basement form in a single, short lasting volcanic event as large igneous province or is it an amalgamation of very large shield volcanoes that may have formed over a larger time span as the southeast Indian Ocean progressively opened? Are there any compositional changes in the magma sources through time? Another striking feature of the Mozambique Ridge is the common occurrence of small volcanic cones and similar volcanic edifices in the top regions of the plateaus and on their flanks. It is extremely unlikely that these tiny features have survived sedimentary, tectonic, and erosional processes for more than 100 mill years. Therefore we conclude that they represent at least one younger or late-stage episode of volcanism, which has affected the entire Mozambique Ridge. This hypothesis is consistent with preliminary results of the SO232 seismic data, which reveals that the magmatic basement of the ridge penetrates the overlying sedimentary layers in places. According to our sampling attempts, these presumably "young" volcanoes appear to consist mainly of heavily altered volcanoclastic rocks, which are not suitable for age dating or geochemistry. At some cones, however, dredging yielded lavas and/or lava fragments incorporated or attached to the volcanoclastics. Geochemical analyses and age dating of these lavas will allow to constrain timing and origin of the late-stage volcanism.

5.2.3 List of abbreviations

BSH	Bundesamt für Seeschifffahrt und Hydrographie
cc	Calcium carbonate
EM-120	Multi-beam system (Kongsberg SIMRAD Echosounder)
IODP	International Ocean Discovery Project
m b.s.l.	Metre below sea level
Mn	Manganese
NOAA	National Oceanic and Atmospheric Administration

5.3 Marine sediment echosounding using Parasound

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Christian Burmeister¹

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5.3.1 Scientific objectives

Bottom and sub-bottom reflection patterns obtained by Parasound characterize the uppermost sediments of the ocean in terms of their acoustic behaviour down to about 200 m below the sea floor. This can be used to study depositional environments and their variation in space and time. The objectives of sediment echosounding during SO232 were:

- to provide a high-resolution counterpart for the uppermost sections of seismic profiles recorded during the cruise,
- to provide information about the sedimentary cover on top of the Mozambique Ridge and seamount peaks

5.3.2 Technical aspects and modes of operation

RV *Sonne* is equipped with a Deep Sea Sediment Echo Sounder Parasound (ATLAS HYDROGRAPHIC, Bremen, Germany) DS III-P70. An overview about the system set up and operation of "Parasound DS III-P70" is given by Niessen *et al.* (in Klages and Thiede, 2011)) and Niessen *et al.* (in Schiel, 2009)).

The hull-mounted Parasound system generates two primary frequencies selectable between 18 and 23.5 kHz transmitting in a narrow beam of 4° at high power. As a result of the non-linear acoustic behaviour of water, the so-called "Parametric Effect", two secondary harmonic frequencies are generated of which one is the difference (e.g. 4 kHz) and the other the sum (e.g. 40 kHz) of the two primary frequencies, respectively. As a result of the longer wave length, the lower parametric frequency allows sub-bottom penetration up to 200 m (depending on sediment conditions) with a vertical resolution of about 0.30 m. The primary advantage of parametric echosounders is based on the fact that the sediment-penetrating pulse is generated within the narrow beam of the primary frequencies thereby providing a very high lateral resolution compared to conventional 4 kHz-systems.

On RV *Sonne*, Parasound DS III-P70 is controlled by two operator software packages plus server software running in the background. These processes are running simultaneously on a PC under "Windows XP". (i) ATLAS HYDROMAP CONTROL (Version 2.2.5) is used to run the system by an operator. The selected modes of operation, sounding options and ranges used during the cruise are summarized in Table 5.3. A list of abbreviations is given at the end of this chapter. (ii) ATLAS PARASTORE (Version 3.3.7) is used by the operator for on-line visualization (processing) of received data on PC screen, for data storage and printing. It can also be used for replaying of recorded data, post-processing and further data storage in different output formats (PS3 and/or SEG-Y). For any further details the reader is referred to the operator manuals of ATLAS HYDROMAP CONTROL, of ATLAS PARASTORE and some basic descriptions given by Niessen *et al.* (in Schiel, 2009)).

Tab. 5.3: Settings of Parasound operation used on SO232

Used Settings	Selected Options	Selected Ranges
Mode of Operation	P-SBP/SBES	PHF, SLF
Frequency	PHF	18.750 kHz
	SLF	4.166 kHz
Pulse length	No. of periods	2 (normal operation)
	Length	0.5 ms at 2 periods
Transmission Source Level	Transmission Power	100%
	Transmission Voltage	158 V
Beam Steering	None	
Mode of Transmission	Pulse Train	300 ms
	Quasi-Equidistant	Interval 400-700 ms
Pulse Type	Continuous Wave	
Pulse Shape	Rectangular	
Receiver Band Width	Output Sample Rate (OSR)	6.1 kHz (manual mode)
	Band Width (% of OSR)	66% (manual mode)
Reception Shading	None	
System Depth Source	Fix Min/Max Depth Limit	Other (EM-120) Manual ATLAS PARASTORE Controlled Atlas Parasound PHF
Water Velocity	C-Mean	Manual 1,500 m/s
	C-Keel	Manual 1,500 m/s
Data Recording	PHF	Full Profile
	SLF	Full Profile

5.3.3 Data acquisition, management, system failure and data quality

During SO232 digital data acquisition and storage were switched on with full data acquisition, when the 12 nm EEZ of South Africa was left on March 31 at 9:13 PM UTC. Acquisition and storage of data were finished on April 1st at 02:07 AM UTC after the system crashed. Until April 1st at 1:22 PM UTC several repair tests were run but the system could not be fixed (Table 5.4). Acquisition included PHF and SLF data and traces were visualized as online profiles on screen.

For the periods defined above eight different types of on-line data files were stored on hard discs:

(1-3) PHF data in ASD and PS3

(4-6) SLF data in ASD and PS3

5.3 Marine sediment echosounding using Parasound

- (7) Navigation data and general Parasound settings (60 s intervals) in ASCII format,
- (8) Auxiliary data about ATLAS PARASTORE settings in ASCII format.

All ASD data files stored are automatically packed into "cabinet files" by Atlas software. The files are named according to date and time of recording (containing about 5 minutes of acquired data per ASD file, about 10 minutes of data per PS3 or SEG-Y file). The data have been sorted by the operator into folders according to data type and recording dates (0 to 24 hours UTC), copied to one external hard disk via fast USB-board and backed up on a second hard disc. In total 371 files in 13 folders of data with a total volume of 5.73 GB were stored on external discs. These data will be transferred to the AWI data base for being available through PANGAEA (www.pangaea.de) after publication. We will use the ship's database (full record of GPS-positions in one-minute intervals) for geo-referencing the Parasound data of the cruise.

Table 5.4: Summary of Parasound data acquisition

Date 2014	From UTC	Until UTC	Duration (h)	reason
31.03.	21:13	02:07	4.9	Running Parasound until first failure reports
01.04.	03:19	03:38	0.31	Restart Parasound without storage and running until next failure
01.04.	04:06	07:42	3.6	Restart Parasound and running until next failure
01.04	08:52	13:22	4.5	Restart Parasound and running until next failure
Sum of operation time			13.31	

During the entire period of acquisition the system was operator controlled (watch keeping). Book keeping was carried out including basic Parasound system settings, some navigation information, various kinds of remarks as well as a low-resolution bathymetry plot with hand-drawn sub-bottom sediment structures.

Data quality was good to very good throughout data acquisition and not affected by ship motion.

In total a number of 2 Operator PC or system crashes were observed during the cruise. The crash was caused by hardware failure.

5.3.4 List of abbreviations

ASCII	American Standard Code for Information Interchange
ASD	Atlas Sounding Data
C	Water sound velocity
CM	Control Module
EEZ	Exclusive Economic Zone

EM-120	Multi-Beam System (SIMRAD Echosounder)
mbsf	Meters below sea floor
OBS	Ocean bottom seismometer
PHF	Primary High Frequency
P-SBP	Parametric Sub-bottom Profiling
PS3	Export format of Parasound data
P70	Product version of Parasound with 70 kW pulse transmission power
RV	Research Vessel
SBES	Single-Beam Echo-Sounder
SEG-Y	Society of Exploration Physicists-Standard Format for Seismic Data
SLF	Secondary Low Frequency
SPM	Signal Processing Module
USB	Universal Serial Board

5.4 Bathymetry (Simrad EM120)

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5.4.1 Objectives

Precise depth information and bathymetric charts of the Mozambique Ridge are fundamental for geophysical and geological interpretation. Although bathymetric data was already collected on several expeditions in this area (e.g. SO182, SO183, 64PE305, and 64PE306) there still exist large unmapped regions.

In these regions often only predicted bathymetry based on satellite radar altimetry data as included in the *General Bathymetric Chart of the Oceans* (GEBCO) dataset is available. However, the spatial resolution of this dataset is not sufficient for geoscientific work. In order to find suitable positions for dredging (i.e. preferably steep slopes) it is crucial to have precise knowledge of the seafloor topography. The high resolution multibeam bathymetric data acquired during the SO232 SLIP expedition will improve the bathymetric knowledge in this region. Together with the seismic data collected on this cruise the bathymetric data will help to reconstruct the geological evolution of the study area. In addition, bathymetric data are required for geophysical/geological pre-site surveys in preparation of site-proposals to the International Ocean Discovery Project (IODP). Furthermore, the acquired and processed data collected on this cruise will be added to the GEBCO dataset.

5.4.2 Work at sea

5.4.2.1 Technical settings

The *Kongsberg Simrad EM120* is a hull-mounted multibeam echo sounder (MBES). It transmits 191 beams per ping and can operate from 20 m to 11000 m water depth. The main operational frequency is 12 kHz (frequencies in the range of 11.25 to 12.75 kHz are employed to code the different transmit sectors) and it has a maximum ping rate of 5 Hz. The aperture angle is variable and has a maximum coverage sector up to 150° (75° port, 75° starboard) which means nearly 6 times swath coverage of the current water depth can be measured. However, even if stated by the operator the system will reduce the swath width by itself if the conditions do not allow the predefined maximum angle. The single beams have a footprint size (beamwidth) of 2° in along and across direction. For movement compensation (roll, pitch, heave) of the ship the MBES system uses data of the *Kongsberg Seatex Motion Reference Unit (MRU) 5*. The heading and gyro information is acquired by the *Anschütz Standard 22 Kreiselanlage*. The GPS position (no DGPS available during this cruise) is received by the *Seastar 9200*. All these different data is collected and processed by the Kongsberg software Seafloor Information System (SIS) at the operator station, which applies all corrections, displays the results and logs the data to internal disks.

5.4.2.2 Data acquisition

Bathymetric measurements were conducted continuously during the whole cruise with the *Kongsberg Simrad EM120* MBES. Data acquisition started on March 31st, 2014 at 21:13 UTC after leaving the 12 nm zone of South Africa and lasted until May 11th, 2014, 06:15 UTC when reaching a water depth below 150m on the South African continental shelf. There was no significant data loss due to system crashes or other reasons despite two events: Between April 1st, 23:41 UTC and April 2nd, 01:13 UTC a data loss of about 1.5 hours occurred due to a damaged GPS receiver which had to be replaced. On April 24th there was no data recording for about one hour due to system tests. Data recording was also switched off during dredge station work.

The raw data was stored in 30 minute blocks in the SIMRAD *.all-format. The ping mode was mostly set to *automatic* (sometimes manually set to *deep*) and the beam spacing was set to *equidistant*.

The EM120 data quality is highly dependent upon the signal to noise ratio being influenced by weather conditions, type of the seafloor, possible interference with other sounders, ship movement, and speed. Seismic studies were conducted at ship speed of 5 knots, dedicated multibeam surveys were run at 10 knots, and during transit the survey speed was about 10-12 knots. The aperture angle was mostly set to 130° (65° port, 65° starboard). However, due to a not yet identified error, the swath width actually used by the system varied quite largely. Even if there was apparently no change in the outer conditions (sea state, wind, course) the system varied the aperture angle between about 70° to 130° (in extreme cases only 30°) within a time span of minutes to hours (Figure 5.66). The desired angle of 130° was only seldom reached. This behaviour also occurred during perfect weather conditions and was independent of ship speed or system parameter settings. *Kongsberg* was informed about the problem and they suggested some system tests which were performed by the system administrators. Unfortunately until the end of the cruise no improvement was achieved.

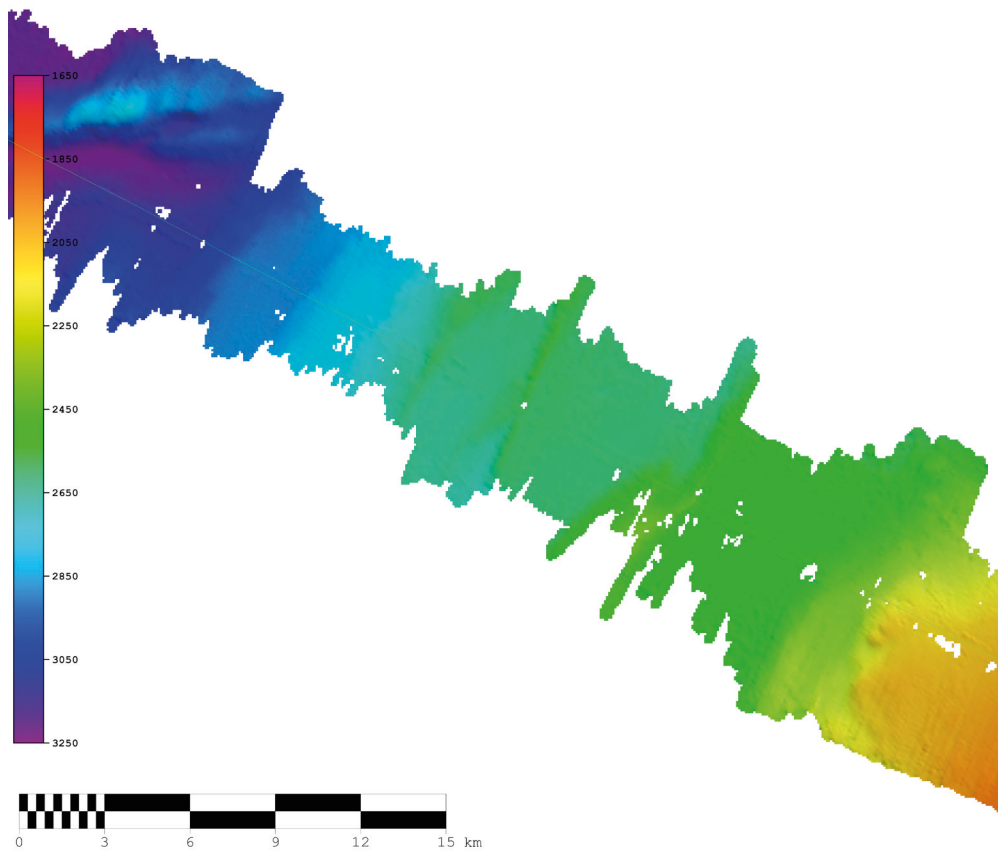


Fig. 5.66 Example of the varying aperture angle used by the EM120 during a 5.5 hour survey line. (Swath width was set to 65° port and 65° starboard side by the operator).

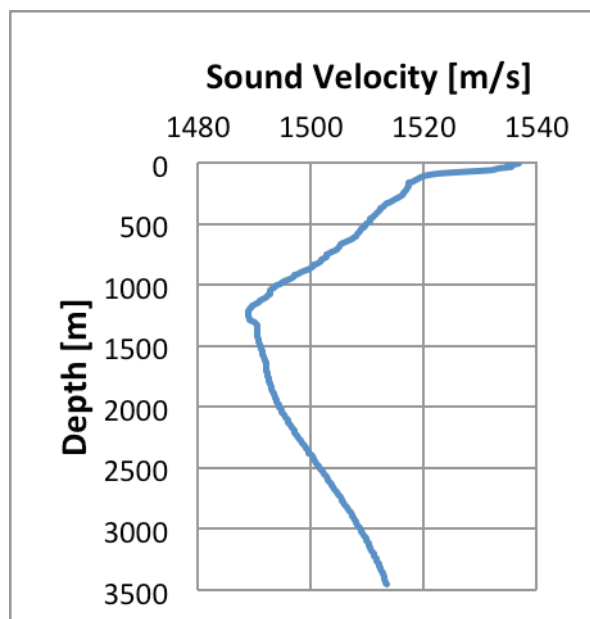


Fig. 5.67: SVP used for sound velocity correction during SO232

5.4.2.3 Sound velocity correction

An adequate sound velocity profile (SVP) during a bathymetric survey is crucial to avoid depth errors due to refraction. To obtain the SVP, physical properties of seawater (conductivity, temperature, pressure) in the water column have to be determined, e.g. via a CTD-cast. On this cruise a CTD-cast was performed during transit shortly before reaching the research area on April 1st, 2014 (13:31 UTC) at 32°31'41"S / 32°43'50"E down to 3458 m (Figure 5.67). The position of the station is shown in Figure 5.69. The CTD data was collected with the *Sea-Bird SBE Model 9 CTD* using the software *Sea-Bird Seasave 7.20S* and processed with the software *Sea-Bird SBE Data Processing V.7.20b*.

However, in addition to the SVP, a sound velocity sensor installed close to the transducer array continuously measures the sound speed at the sea surface. This sound speed is also transmitted to the SIS and used for sound velocity correction during data acquisition. The SVP was imported into SIS and applied to the bathymetric data during data acquisition and processing.

5.4.2.4 Data processing

All raw data was already processed during the cruise, using the software *CARIS HIPS & SIPS 8.1.2*. The data acquired by the SIS software were converted into the *HDCS*-format with the *Conversion Wizard* tool. Navigation errors were checked with the *Navigation Editor*. Data was manually cleaned from coarse depth errors by using the *Swath Editor*, a ping-by-ping data-cleaning editor and occasionally the *Subset Editor*, where the data can be viewed and cleaned in a 3D-view. Systematic depth errors were observed near the centre beam, symmetrically on port and starboard side with a parabolic shape, occurring especially in flat areas (Figure 5.68). In areas with a more diverse topography this systematic error is decreased.

Bathymetric maps (grids) were calculated for quality checks using the *BASE Surface* function of *CARIS*. Finally the data were exported to ASCII xyz-format to create maps with the open source software package *Generic Mapping Tools* (GMT) and for importing into the 3D visualization software *QPS Fledermaus*.

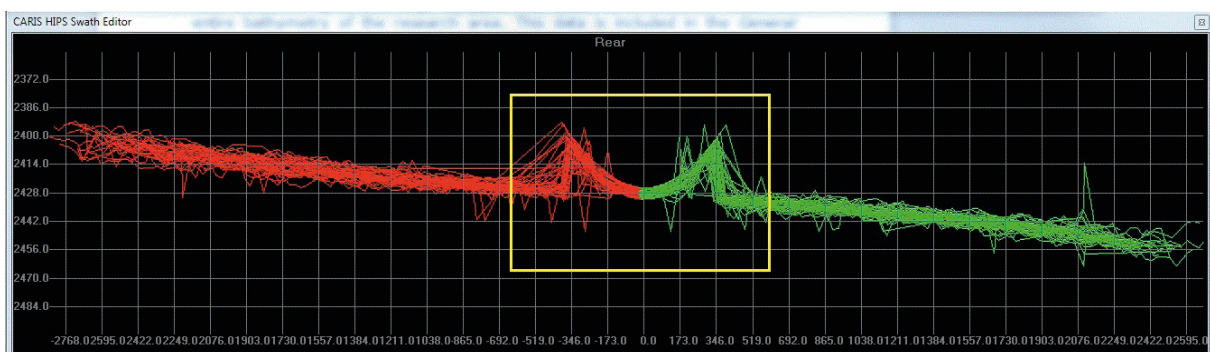


Fig. 5.68 Systematic error in depth acquisition (rear view with Swath Editor). In the centre of the swath (yellow box) the beams are crooked upward with a parabolic form.

5.4.3 Preliminary results

5.4.3.1 Survey statistics

During SO232 45,520,107 soundings (pings) were recorded and 7,299,578 (16%) soundings were erased during data processing. Data were acquired on 42 separate days (data are stored in 1,547 raw-data files). In total an area of about 57,469 km² with a track length of about 8,159 km was mapped during this cruise. Figure 5.69 shows an overview of the cruise track and measured bathymetry in the research area, and the position where the SVP was taken.

5.4.3.2 Bathymetry of SO232 in the research area

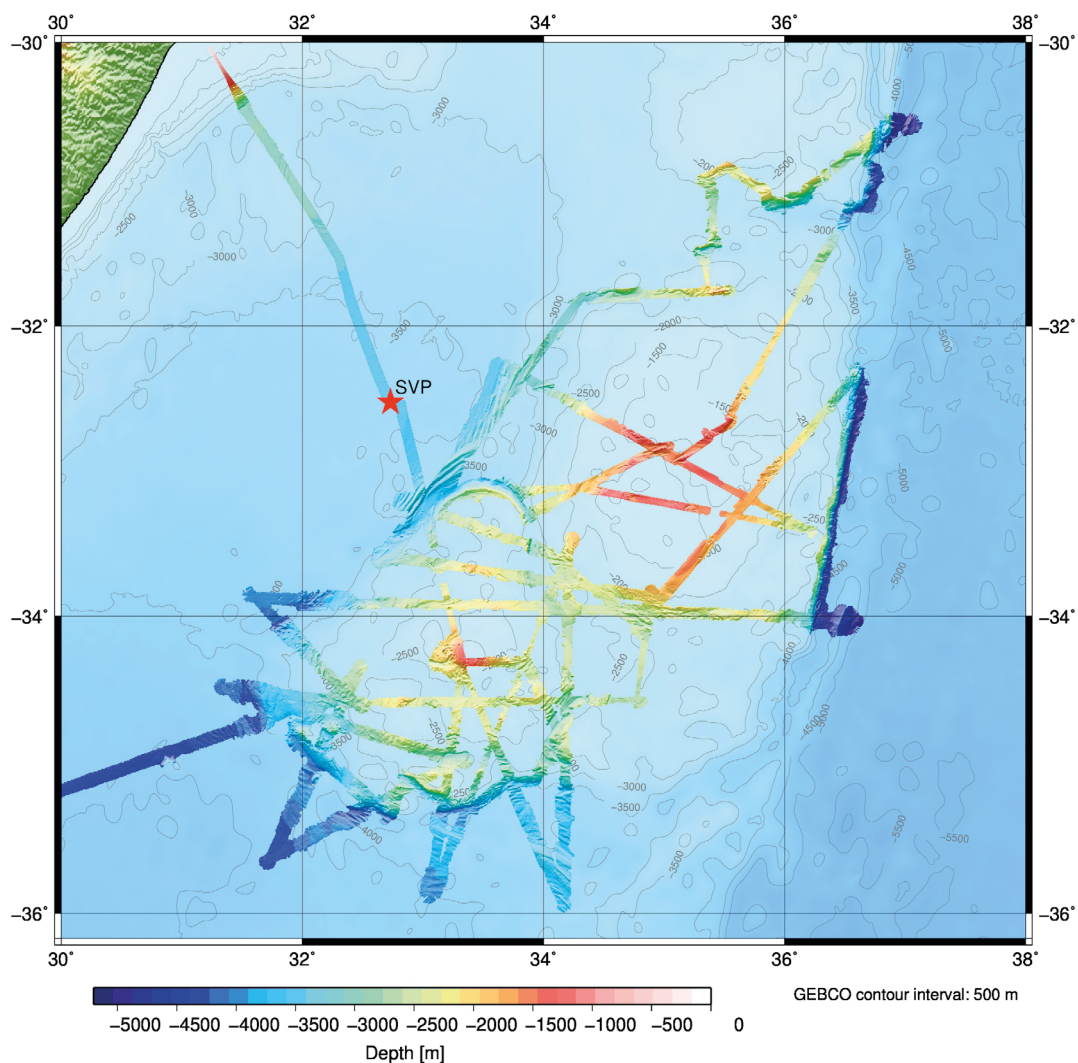


Fig. 5.69: MBES bathymetry of SO232, and position of SVP. The 500 m contour lines (grey lines) are derived from the GEBCO_08 grid. The SVP position is marked with a red star.

5.4.3.3 Bathymetry of SO232 IODP proposal 834 pre-site survey

In preparation of an IODP proposal on the Agulhas Plateau (Uenzelmann-Neben *et al.*, 2013) a pre-site survey was performed during transit to Cape Town. From May, 8th, 2014 (4:00 UTC) to May, 10th, 2014 (6:00 UTC) the area shown in Figure 5.70 was mapped with the EM120, two seismic profiles were recorded and three dredge stations were carried out.

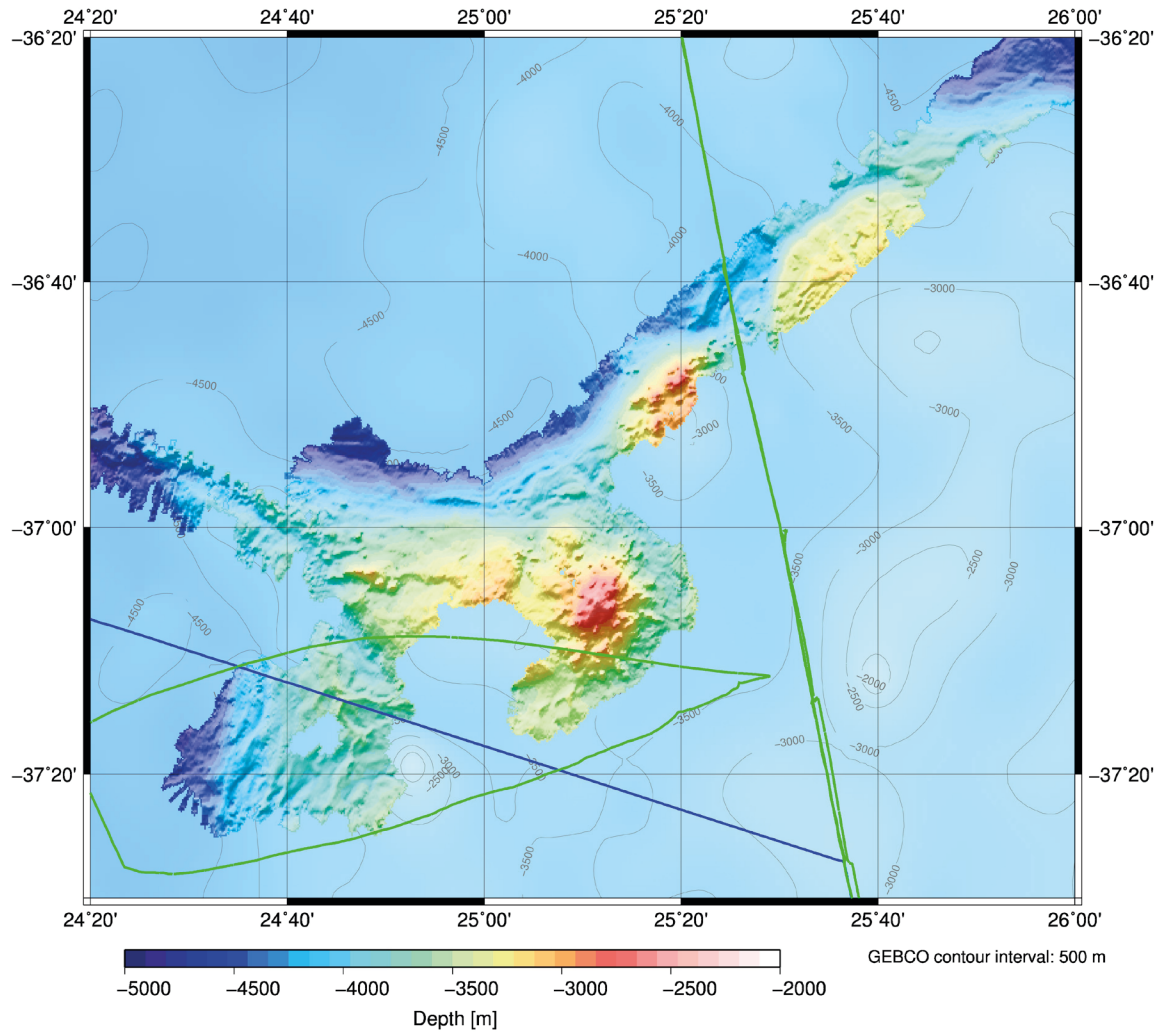


Fig. 5.70: SO232 MBES bathymetry of the IODP proposal 834 pre-site survey. The 500 m contour lines (grey lines) are derived from the GEBCO_08 grid. The blue and green lines are track lines of existing multibeam surveys from the expedition ANT-XXIII/9 with RV *Polarstern* in 2007 and of SO182 with RV *Sonne* in 2005.

6. MARINE MAMMAL OBSERVATIONS

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6.1 Objectives

Marine mammal observations during SO232 were aimed at reducing the risk of injury to negligible levels and at reducing the risk of disturbance from seismic surveys to whales and dolphins following the guidelines of the Joint Nature Conservation Committee (JNCC Joint Nature Conservation Committee, 2010).

6.2 Work at sea

6.2.1 MMO operations

The Marine Mammal Observer (MMO) team of SO232 consisted of one non-dedicated lead MMO (JNCC trained), one non-dedicated supervisor and three dedicated MMOs (Table 6.1). The dedicated MMOs were concentrating on continuously watching the sea surface searching for marine mammals and recording weather conditions, source activity as well as marine mammal sightings during their watches. The MMO team was introduced to the guidelines of the JNCC by the non-dedicated and JNCC trained lead MMO prior to the seismic survey. The JNCC guidelines suggest a pre-shooting search of 60 minutes in deep waters (>200 m) before the soft-start of the airguns (JNCC Joint Nature Conservation Committee, 2010, Barton, 1996-2012). The JNCC guidelines constitute that the soft-start must be delayed or interrupted if marine mammals approach the mitigation zone (500 m distance from airguns) during this period (Barton, 1996-2012, JNCC Joint Nature Conservation Committee, 2010). According to the JNCC guidelines there is no shut-down of the airguns required once the soft-start has commenced, even if marine mammals are detected within the mitigation zone (JNCC Joint Nature Conservation Committee, 2010, Barton, 1996-2012). Nevertheless, during SO232 the airguns were shut-down any time when a MMO detected marine mammals within the mitigation zone during the seismic survey.

Tab. 6.1: SO232 MMO team, tasks and training

Name	Task	Training
Gabriele Uenzelmann-Neben	Non-dedicated MMO lead	JNCC UK
Antje Müller-Michaelis	Non-dedicated MMO supervisor	None
Jens Brack	Dedicated MMO Watch: 12:30-16:30 UTC	None
Manuel Moser	Dedicated MMO Watch: 02:30-07:30 UTC	None
Raimund Scheuvens	Dedicated MMO Watch: 07:30-12:30 UTC	None

6.3 Results

From 02.04.2014 02:34 UTC to 09.05.2014 16:03 UTC a continuous visual watch of one dedicated MMO at any daytime was conducted on the bridge of the *Sonne* (13.5 m above sealevel). As visibility was restricted during nighttime, the MMO watch hours were roughly assessed to range from 02:30 to 16:30 UTC (Table 6.1). These times were corrected by the observations of dawn and dusk during the MMO watches to approx. 03:30 to 16:00 UTC (see appendix: effort forms). The MMOs were equipped with two FUJINON 7x50 FMTRC-SX binoculars and used the rangefinder method to approximate the distance of marine mammals from the ship.

6.2.2 MMO recordings

The four JNCC marine mammal recording forms were used to log the monitoring of the MMOs (JNCC Joint Nature Conservation Committee, 2010):

1. Cover page

The cover page contains general information of the survey and was filled in by the non-dedicated MMO supervisor.

2. Operations form

The operations form contains details of the use of the source with the purpose to assess compliance with the guidelines. Therefore, the times of airgun activity and its changes were recorded. These were obtained from the seismic log by the non-dedicated MMO supervisor.

3. Effort form

The effort form was only filled in by the dedicated MMOs for periods actually spent observing, i.e. during their watches. The effort form contains length of time spent monitoring, location, observer, weather conditions and source activity. These variables may influence the number of sightings and need to be taken into account when comparisons in sightings rates are made. The effort form was filled in at least once an hour to give a reasonably frequent record of position and speed. Additionally, it was recorded whenever source activity or weather conditions (particularly sea state, swell, visibility, sun glare or precipitation) changed.

4. Sightings form

The sighting forms contain the details (number, time, location, distance, direction of travel, description, behaviour) of sightings of marine mammals.

The dedicated MMOs filled in the effort and sightings forms during their watches. The handwritten deckforms were transferred to excel spreadsheets by the MMO supervisor (see appendix A.7).

6.3 Results

10 sightings were recorded by the MMOs during SO232 and are summarized in Table 3.1. Three of these sightings took place during the seismic survey and only one of these sightings forced a shut-down of the airguns as the detected whale entered the mitigation zone of < 500 m distance (Table 6.2).

Tab. 6.2 Summary of sightings during SO232

Date	Time (UTC)	Position	Species/ description	Closest approach (m)	Airgun activity	Action
26/04/14	11:24-11:59	33° 07,29' S 33° 32,12' E	2 small whales	750	not firing	none
26/04/14	13:05-13:34	33° 05,16' S 33° 21,12' E	1 pilot whale	2500	not firing	none
26/04/14	14:44-14:54	33° 05,55' S 33° 29,26' E	1 pilot whale	3000	not firing	none
27/04/14	07:27-07:33	33° 00,10' S 34° 36,05' E	2 bryde or sei whales	50	not firing	none
28/04/14	04:53-06:41	32° 45,38' S 35° 21,18' E	1 large and 1 small blast	750	not firing	none
28/04/14	08:27-08:44	32° 38,20' S 35° 33,58' E	1 blast ca 2m, vertical, narrow cloud	650	not firing	none
30/04/14	11:39-13:18	30° 33,92' S 36° 52,85' E	1 blast	250	not firing	none
03/05/14	11:11-11:50	32° 40,44' S 33° 31,68' E	2 large and 1 small blast	900	firing	none
03/05/14	12:03-12:35	32° 42,64' S 33° 29,65' E	1 10-12m black whale, small fin	50	firing	47 min shut-down of airguns
05/05/14	06:24-06:40	34° 05,65' S 34° 50,66' E	1 fin whale	750	firing	none

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APPENDIX

- A.1 TEILNEHMENDE INSTITUTE/PARTICIPATING INSTITUTIONS**
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- A.3 SCHIFFSBESATZUNG/SHIP'S CREW**
- A.4 STATIONSLISTE/STATION LIST**
- A.5 REGISTRIERPARAMETER DER REFLEXIONSSEISMIK/SEISMIC
REFLECTION RECORDING PARAMETERS**
- A.6 ROCK SAMPLE DESCRIPTIONS**
- A.7 MMO RECORDING LIST**

A.1 TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTIONS

	Address
AWI	Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung Postfach 120161 27515 Bremerhaven Germany
EDV-Nord.info	EDV-Nord.info Auf der Brigg 4 27570 Bremerhaven Germany
GEOMAR	GEOMAR Helmholtz-Zentrum für Ozeanforschung Wischhofstr. 1-3 24108 Kiel Germany
MfN	Museum für Naturkunde Berlin Invalidenstr. 43 10115 Berlin Germany
University of Cape Town	Geological Department University of Cape Town Rondebosch 7700, Cape Town South Africa

A.2 FAHRTTEILNEHMER / CRUISE PARTICIPANTS

Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession
Dr. Uenzelmann-Neben	Gabriele	AWI	Chief Scientist, Seismics
Anders	Maria	GEOMAR	Student, Petrology
Brack	Jens	AWI	Student, MMO
Burmeister	Christian	AWI	Student, Parasound
Cawthra	Hayley	UCT	PhD student, Seismics
Eggers	Thorsten	EDV-Nord.info	Technician, Electronics
Fischer	Maximilian	AWI	PhD student, Seismics
Freund	Madeleine	AWI	Student, Parasound
Furchheim	Nina	MfN	PhD Student, Biology
Dr. Grützner	Jens	AWI	Post Doc, Seismics
Dr. Hauff	Folkmar	GEOMAR	Senior Scientist, Petrology
Hauff	Silke	GEOMAR	Technician, Petrology
Heinrich	Mirja	GEOMAR	Student, Petrology
Dr. Jacques	Guillaume	GEOMAR	Post-Doc, Petrology
Jensen	Laura	AWI	Technician, Simrad
Lensch	Norbert	AWI	Technician, Airguns
Merl	Maximilian	AWI	Student, Seismics
Dr. Müller-Michaelis	Antje	AWI	Post-Doc, seismics
Moser	Manuel	AWI	Student, MMO
Petersen	Florian	AWI	Student, Parasound
Peukert	Anne	GEOMAR	Student, Petrology
Pietsch	Ricarda	AWI	PhD student, Seismics
Scheuvers	Raimund	AWI	Student, MMO
Dr. Werner	Reinhard	GEOMAR	Senior Scientist, Petrology

A.3 SCHIFFSBESATZUNG / SHIP'S CREW

No.	Name	Rank
1	Detlef Korte	Master
2	Ulrich Büchele	1. Offc.
3	Werner Guzman	Ch. Eng.
4	Lars Hoffsommer	2. Offc.
5	Olaf W. Schmitz	2. Offc.
6	Dr. Bodo Bauer	Doctor
7	Andreas Rex	2. Eng.
8	Carsten Pieper	2. Eng.
9	Jörg Leppin	ELO
10	Wolfgang Borchert	System Manager
11	Andreas Schrapel	Boatsw.
12	Ingo Fricke	A.B.
13	Frank Heibeck	A.B.
14	Christian Kallenbach	A.B.
15	Jürgen Kraft	A.B.
16	Jens Kuderski	A.B.
17	Hans Mehlhase	A.B.
18	Günter Stängl	A.B.
19	Ryszard Krawczak	Motorman
20	Torsten Bolik	Motorman
21	Volker Blohm	Fitter
22	Oleksandr Ossadchy	Electrician
23	Frank Tiemann	Cook
24	Jörg Bohne	Baker
25	Harry Schmandke	1. Steward
26	Rene Lehm	2. Steward

A.4 STATIONSLISTE / STATION LIST

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/001-1	4/1/2014	13:34	32° 31,67' S	32° 43,87' E	14.7	CTD	Beginn Station	
SO232/001-1	4/1/2014	13:34	32° 31,67' S	32° 43,87' E	14.7	CTD	zu Wasser	W 4
SO232/001-1	4/1/2014	15:02	32° 31,21' S	32° 44,38' E	3553.2	CTD	auf Tiefe	SLmax: 3500 m
SO232/001-1	4/1/2014	15:04	32° 31,21' S	32° 44,39' E	3552.7	CTD	Hieven	
SO232/001-1	4/1/2014	16:11	32° 30,96' S	32° 44,85' E	3554.4	CTD	an Deck	
SO232/001-1	4/1/2014	17:20	32° 30,86' S	32° 47,62' E	3554.7	CTD	Ende Station	
SO232/002-1	4/2/2014	4:54	34° 22,94' S	33° 20,61' E	2148.4	Profil	Stationsbeginn	AWI-20140201
SO232/002-1	4/2/2014	4:56	34° 23,07' S	33° 20,64' E	2163	Profil	Streamerendboje z.W.	
SO232/002-1	4/2/2014	5:00	34° 23,30' S	33° 20,69' E	2172.8	Profil	Bird z. W.	Nr. 01
SO232/002-1	4/2/2014	6:33	34° 28,42' S	33° 23,29' E	2434.7	Profil	Bird z. W.	Nr. 12
SO232/002-1	4/2/2014	6:40	34° 28,81' S	33° 23,51' E	2423.8	Profil	Streamer zu Wasser	SL: 3000 m
SO232/002-1	4/2/2014	7:00	34° 29,91' S	33° 24,06' E	2444.2	Profil	Bb-Airgunarray zu Wasser	
SO232/002-1	4/2/2014	7:17	34° 30,88' S	33° 24,62' E	2394.5	Profil	Airgun eingeschaltet	
SO232/002-1	4/2/2014	7:33	34° 32,17' S	33° 25,25' E	2369.8	Profil	Beginn Profil	rwk: 156°, d: 92 nm
SO232/002-1	4/3/2014	2:00	35° 56,55' S	34° 10,68' E	3694.8	Profil	Ende Profil	
SO232/002-1	4/3/2014	2:00	35° 56,55' S	34° 10,68' E	3694.8	Profil	Stationsende	
SO232/003-1	4/3/2014	2:20	35° 56,73' S	34° 9,41' E	3698.9	Profil	Stationsbeginn	AWI-20140202
SO232/003-1	4/3/2014	2:20	35° 56,73' S	34° 9,41' E	3698.9	Profil	Beginn Profil	rwk: 001°, d: 149 nm
SO232/003-1	4/3/2014	4:57	35° 46,88' S	34° 9,77' E	3497.3	Profil	Bb-Airgunarray an Deck	
SO232/003-1	4/3/2014	5:38	35° 44,85' S	34° 9,83' E	3463.6	Profil	Bb-Airgunarray zu Wasser	
SO232/003-1	4/3/2014	5:46	35° 44,34' S	34° 9,85' E	3391.5	Profil	Airgun Soft Start	
SO232/003-1	4/4/2014	10:33	33° 28,61' S	34° 13,20' E	1993.8	Profil	Ende Profil	
SO232/003-1	4/4/2014	10:33	33° 28,61' S	34° 13,20' E	1993.8	Profil	Stationsende	
SO232/004-1	4/4/2014	11:27	33° 29,25' S	34° 15,45' E	1858.2	Profil	Stationsbeginn	AWI-20140203
SO232/004-1	4/4/2014	11:27	33° 29,25' S	34° 15,45' E	1858.2	Profil	Beginn Profil	rwk: 202°, d: 155 nm
SO232/004-1	4/5/2014	19:42	35° 52,49' S	33° 4,30' E	3951.7	Profil	Ende Profil	
SO232/004-1	4/5/2014	19:42	35° 52,49' S	33° 4,30' E	3951.7	Profil	Stationsende	
SO232/005-1	4/5/2014	19:42	35° 52,49' S	33° 4,30' E	3951.7	Profil	Stationsbeginn	AWI-20140204
SO232/005-1	4/5/2014	19:42	35° 52,49' S	33° 4,30' E	3951.7	Profil	Beginn Profil	rwk: 008°, d: 82 nm
SO232/005-1	4/6/2014	14:52	34° 30,68' S	33° 18,09' E	2454.3	Profil	Ende Profil	
SO232/005-1	4/6/2014	14:53	34° 30,62' S	33° 18,10' E	2456.4	Profil	Airgun abgeschaltet	
SO232/005-1	4/6/2014	15:09	34° 29,85' S	33° 18,24' E	2462.2	Profil	Bb-Airgunarray an Deck	
SO232/005-1	4/6/2014	15:15	34° 29,54' S	33° 18,30' E	2460.4	Profil	Beginn hieven Streamer	
SO232/005-1	4/6/2014	15:30	34° 28,79' S	33° 18,43' E	2445.7	Profil	Bird a. D.	Nr. 01

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/005-1	4/6/2014	18:19	34° 20,81' S	33° 19,82' E	1826.6	Profil	Bird a. D.	Nr. 12
SO232/005-1	4/6/2014	18:22	34° 20,68' S	33° 19,85' E	1829.1	Profil	Streamer an Deck	
SO232/005-1	4/6/2014	18:26	34° 20,51' S	33° 19,88' E	1740.5	Profil	Streamerendboje an Deck	
SO232/005-1	4/6/2014	18:43	34° 19,78' S	33° 20,03' E	1584.6	Profil	Stationsende	
SO232/006-1	4/6/2014	19:52	34° 11,05' S	33° 17,81' E	1510.4	Kettensack-dredge	Stationsbeginn	
SO232/006-1	4/6/2014	19:59	34° 11,07' S	33° 17,84' E	1468.4	Kettensack-dredge	z.W.	W 6
SO232/006-1	4/6/2014	20:26	34° 11,08' S	33° 17,82' E	1475.1	Kettensack-dredge	Boko	SL: 1467 m
SO232/006-1	4/6/2014	20:28	34° 11,09' S	33° 17,83' E	1468.2	Kettensack-dredge	Auslegen	rwk: 158°, d: 598 m
SO232/006-1	4/6/2014	20:52	34° 11,41' S	33° 17,95' E	1189.9	Kettensack-dredge	Beginn dredgen	SLmax: 1800 m
SO232/006-1	4/6/2014	21:15	34° 11,44' S	33° 17,96' E	1221	Kettensack-dredge	KD hakt	SL: 1421 m, SZmax: 84,0 kN
SO232/006-1	4/6/2014	21:20	34° 11,43' S	33° 17,95' E	1207.4	Kettensack-dredge	KD hakt	SL: 1402 m, SZmax: 76,2 kN
SO232/006-1	4/6/2014	21:36	34° 11,44' S	33° 17,96' E	1225.5	Kettensack-dredge	frei vom Grund	SL: 1190 m
SO232/006-1	4/6/2014	22:05	34° 11,49' S	33° 18,05' E	1308.3	Kettensack-dredge	a.D.	
SO232/006-1	4/6/2014	22:18	34° 11,53' S	33° 18,18' E	1420.2	Kettensack-dredge	Stationsende	
SO232/007-1	4/7/2014	4:32	34° 18,76' S	33° 7,31' E	2506.9	Kettensack-dredge	Stationsbeginn	
SO232/007-1	4/7/2014	4:34	34° 18,75' S	33° 7,32' E	2508.9	Kettensack-dredge	z.W.	W 6
SO232/007-1	4/7/2014	5:18	34° 18,77' S	33° 7,36' E	2510	Kettensack-dredge	Boko	SL: 2460 m
SO232/007-1	4/7/2014	5:19	34° 18,77' S	33° 7,36' E	2517.7	Kettensack-dredge	Auslegen	rwk: 067°, d: 665 m
SO232/007-1	4/7/2014	5:45	34° 18,61' S	33° 7,78' E	2069.9	Kettensack-dredge	Beginn dredgen	SLmax: 2750 m
SO232/007-1	4/7/2014	6:25	34° 18,58' S	33° 7,86' E	2069.4	Kettensack-dredge	frei vom Grund	SL: 2000 m, SZmax: 32,0 kN
SO232/007-1	4/7/2014	7:07	34° 18,57' S	33° 7,83' E	2065.8	Kettensack-dredge	a.D.	
SO232/007-1	4/7/2014	7:12	34° 18,57' S	33° 7,82' E	2073.4	Kettensack-dredge	Stationsende	
SO232/008-1	4/7/2014	7:38	34° 18,66' S	33° 5,80' E	2551.1	Kettensack-dredge	Stationsbeginn	
SO232/008-1	4/7/2014	7:39	34° 18,67' S	33° 5,80' E	2551.8	Kettensack-dredge	z.W.	W 6
SO232/008-1	4/7/2014	8:44	34° 18,71' S	33° 5,81' E	2481.6	Kettensack-dredge	Boko	SL: 2533 m
SO232/008-1	4/7/2014	8:44	34° 18,71' S	33° 5,81' E	2481.6	Kettensack-dredge	Auslegen	rwk: 008°, d: 706 m
SO232/008-1	4/7/2014	9:15	34° 18,29' S	33° 5,88' E	2123.2	Kettensack-dredge	Beginn dredgen	SLmax: 2900 m
SO232/008-1	4/7/2014	10:03	34° 18,29' S	33° 5,96' E	2125.5	Kettensack-dredge	frei vom Grund	SL: 2079 m, SZmax: 63,1 kN
SO232/008-1	4/7/2014	10:48	34° 18,33' S	33° 6,12' E	2147.6	Kettensack-dredge	a.D.	
SO232/008-1	4/7/2014	10:48	34° 18,33' S	33° 6,12' E	2147.6	Kettensack-dredge	Stationsende	
SO232/009-1	4/7/2014	13:13	34° 24,84' S	33° 17,93' E	2305.3	Kettensack-dredge	Stationsbeginn	
SO232/009-1	4/7/2014	13:16	34° 24,84' S	33° 17,93' E	2322.1	Kettensack-dredge	z.W.	W 6
SO232/009-1	4/7/2014	13:55	34° 24,77' S	33° 17,95' E	2305.2	Kettensack-dredge	Boko	SL: 2303 m
SO232/009-1	4/7/2014	14:01	34° 24,75' S	33° 17,97' E	2307.1	Kettensack-dredge	Auslegen	rwk: 360°, d: 741 m

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/009-1	4/7/2014	14:33	34° 24,26' S	33° 17,98' E	1979.8	Kettensack-dredge	Beginn dredgen	SLmax: 2700 m
SO232/009-1	4/7/2014	15:17	34° 24,26' S	33° 18,04' E	2098.6	Kettensack-dredge	frei vom Grund	SL: 1953 m, SZmax: 29 kN
SO232/009-1	4/7/2014	15:56	34° 24,23' S	33° 18,04' E	2143.2	Kettensack-dredge	a.D.	
SO232/009-1	4/7/2014	16:04	34° 24,20' S	33° 17,98' E	2073.2	Kettensack-dredge	Stationsende	
SO232/010-1	4/7/2014	17:42	34° 20,71' S	33° 19,16' E	1947.6	Kettensack-dredge	Stationsbeginn	
SO232/010-1	4/7/2014	17:46	34° 20,71' S	33° 19,20' E	1938	Kettensack-dredge	z.W.	W6
SO232/010-1	4/7/2014	18:22	34° 20,72' S	33° 19,22' E	1936.6	Kettensack-dredge	Boko	SL: 1951 m
SO232/010-1	4/7/2014	18:23	34° 20,72' S	33° 19,22' E	1939	Kettensack-dredge	Auslegen	rwk: 359°, d: 722 m
SO232/010-1	4/7/2014	18:52	34° 20,28' S	33° 19,24' E	1702.7	Kettensack-dredge	Beginn dredgen	SLmax: 2300 m
SO232/010-1	4/7/2014	19:26	34° 20,29' S	33° 19,26' E	1705	Kettensack-dredge	frei vom Grund	SL: 1690 m, SZmax: 30,9 kN
SO232/010-1	4/7/2014	20:02	34° 20,30' S	33° 19,28' E	1725.6	Kettensack-dredge	a.D.	
SO232/010-1	4/7/2014	20:11	34° 20,32' S	33° 19,25' E	1739.6	Kettensack-dredge	Stationsende	
SO232/011-1	4/7/2014	20:38	34° 19,22' S	33° 16,07' E	2059.8	Kettensack-dredge	Stationsbeginn	
SO232/011-1	4/7/2014	20:40	34° 19,21' S	33° 16,09' E	2057.5	Kettensack-dredge	z.W.	W: 6
SO232/011-1	4/7/2014	21:18	34° 19,22' S	33° 16,14' E	2057.2	Kettensack-dredge	Boko	SL: 2067 m
SO232/011-1	4/7/2014	21:18	34° 19,22' S	33° 16,14' E	2057.2	Kettensack-dredge	Auslegen	rwk: 360°, d: 722 m
SO232/011-1	4/7/2014	22:26	34° 18,78' S	33° 16,15' E	1774.5	Kettensack-dredge	Beginn dredgen	SLmax: 2450 m
SO232/011-1	4/7/2014	22:36	34° 18,80' S	33° 16,16' E	1776.7	Kettensack-dredge	frei vom Grund	SL: 1750 m, SZmax: 26,8 kN
SO232/011-1	4/7/2014	23:05	34° 18,86' S	33° 16,21' E	1819.2	Kettensack-dredge	a.D.	
SO232/011-1	4/7/2014	23:17	34° 18,88' S	33° 16,21' E	1817.9	Kettensack-dredge	Stationsende	
SO232/012-1	4/8/2014	2:27	34° 18,14' S	33° 50,67' E	2359	Kettensack-dredge	Stationsbeginn	
SO232/012-1	4/8/2014	2:30	34° 18,14' S	33° 50,65' E	2359.3	Kettensack-dredge	z.W.	W 6
SO232/012-1	4/8/2014	3:12	34° 18,13' S	33° 50,69' E	2397.2	Kettensack-dredge	Boko	SL: 2334 m
SO232/012-1	4/8/2014	3:13	34° 18,13' S	33° 50,69' E	2335.6	Kettensack-dredge	Auslegen	rwk: 358°, d: 890 m
SO232/012-1	4/8/2014	3:48	34° 17,59' S	33° 50,72' E	2192.4	Kettensack-dredge	Beginn dredgen	SLmax: 2800 m
SO232/012-1	4/8/2014	4:27	34° 17,65' S	33° 50,72' E	2167.4	Kettensack-dredge	frei vom Grund	SL: 2185 m, SZmax: 29 kN
SO232/012-1	4/8/2014	5:11	34° 17,60' S	33° 50,70' E	2172.2	Kettensack-dredge	a.D.	
SO232/012-1	4/8/2014	5:28	34° 17,64' S	33° 50,72' E	2195.8	Kettensack-dredge	Stationsende	
SO232/013-1	4/8/2014	11:56	34° 51,71' S	34° 5,16' E	3020.4	Kettensack-dredge	Stationsbeginn	
SO232/013-1	4/8/2014	11:57	34° 51,70' S	34° 5,16' E	3023.9	Kettensack-dredge	z.W.	W 6
SO232/013-1	4/8/2014	12:50	34° 51,65' S	34° 5,24' E	3017.5	Kettensack-dredge	Boko	SL: 3023 m
SO232/013-1	4/8/2014	12:56	34° 51,62' S	34° 5,25' E	3023.4	Kettensack-dredge	Auslegen	rwk: 358°, d: 816 m
SO232/013-1	4/8/2014	13:33	34° 51,16' S	34° 5,20' E	2794.4	Kettensack-dredge	Beginn dredgen	SLmax: 3400 m
SO232/013-1	4/8/2014	14:14	34° 51,07' S	34° 5,24' E	2766.1	Kettensack-dredge	frei vom Grund	SL: 2706 m, SZmax: 34,5 kN

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/013-1	4/8/2014	15:05	34° 51,11' S	34° 5,51' E	2802	Kettensack- dredge	a.D.	
SO232/013-1	4/8/2014	15:17	34° 51,09' S	34° 5,58' E	2746.8	Kettensack- dredge	Stationsende	
SO232/014-1	4/8/2014	18:27	35° 7,25' S	33° 42,93' E	3421.1	Kettensack- dredge	Stationsbeginn	
SO232/014-1	4/8/2014	18:28	35° 7,25' S	33° 42,94' E	3476.8	Kettensack- dredge	z.W.	W 6
SO232/014-1	4/8/2014	19:31	35° 7,27' S	33° 42,94' E	3509.2	Kettensack- dredge	Boko	SL: 3503 m
SO232/014-1	4/8/2014	19:31	35° 7,27' S	33° 42,94' E	3509.2	Kettensack- dredge	Auslegen	rwk: 330°, d: 686 m
SO232/014-1	4/8/2014	19:58	35° 6,88' S	33° 42,78' E	3151.3	Kettensack- dredge	Beginn dredgen	SLmax: 3850 m
SO232/014-1	4/8/2014	20:40	35° 6,87' S	33° 42,79' E	3154.5	Kettensack- dredge	frei vom Grund	SL: 3124 m, SZmax: 49,4 kN
SO232/014-1	4/8/2014	21:44	35° 6,86' S	33° 42,80' E	3158.2	Kettensack- dredge	a.D.	
SO232/014-1	4/8/2014	21:57	35° 6,89' S	33° 42,81' E	3155.3	Kettensack- dredge	Stationsende	
SO232/015-1	4/9/2014	0:25	35° 17,25' S	33° 23,82' E	4031	Kettensack- dredge	Stationsbeginn	
SO232/015-1	4/9/2014	0:25	35° 17,25' S	33° 23,82' E	4031	Kettensack- dredge	z.W.	W 6
SO232/015-1	4/9/2014	1:44	35° 17,11' S	33° 23,81' E	4017	Kettensack- dredge	Boko	SL: 4038 m
SO232/015-1	4/9/2014	1:50	35° 17,06' S	33° 23,80' E	3948.5	Kettensack- dredge	Auslegen	rwk: 359°, d: 836 m
SO232/015-1	4/9/2014	2:19	35° 16,62' S	33° 23,80' E	3460.9	Kettensack- dredge	Beginn dredgen	SLmax: 4400 m
SO232/015-1	4/9/2014	3:11	35° 16,63' S	33° 23,79' E	3519.2	Kettensack- dredge	frei vom Grund	SL: 3478 m, SZmax: 48 kN
SO232/015-1	4/9/2014	4:20	35° 16,60' S	33° 23,79' E	3514.4	Kettensack- dredge	a.D.	
SO232/015-1	4/9/2014	4:30	35° 16,56' S	33° 23,84' E	3474.3	Kettensack- dredge	Stationsende	
SO232/016-1	4/9/2014	4:56	35° 17,07' S	33° 22,08' E	3894.4	Kettensack- dredge	Stationsbeginn	
SO232/016-1	4/9/2014	4:58	35° 17,06' S	33° 22,09' E	3910.4	Kettensack- dredge	z.W.	W 6
SO232/016-1	4/9/2014	6:14	35° 17,07' S	33° 22,12' E	3907.8	Kettensack- dredge	Boko	SL: 3928 m
SO232/016-1	4/9/2014	6:15	35° 17,07' S	33° 22,12' E	3892.4	Kettensack- dredge	Auslegen	rwk: 360°, d: 741 m
SO232/016-1	4/9/2014	6:45	35° 16,62' S	33° 22,16' E	3370.6	Kettensack- dredge	Beginn dredgen	SLmax: 4250 m
SO232/016-1	4/9/2014	7:35	35° 16,62' S	33° 22,18' E	3405.6	Kettensack- dredge	frei vom Grund	SL: 3322 m, SZmax: 50,0 kN
SO232/016-1	4/9/2014	8:44	35° 16,64' S	33° 22,16' E	3374.1	Kettensack- dredge	a.D.	
SO232/016-1	4/9/2014	8:53	35° 16,64' S	33° 22,18' E	3354.8	Kettensack- dredge	Stationsende	
SO232/017-1	4/9/2014	9:36	35° 17,46' S	33° 16,11' E	3577.6	Kettensack- dredge	Stationsbeginn	
SO232/017-1	4/9/2014	9:38	35° 17,48' S	33° 16,12' E	3584.8	Kettensack- dredge	z.W.	W 6
SO232/017-1	4/9/2014	10:41	35° 17,36' S	33° 16,07' E	3497.4	Kettensack- dredge	Boko	SL: 3539 m
SO232/017-1	4/9/2014	10:45	35° 17,34' S	33° 16,05' E	3470.1	Kettensack- dredge	Auslegen	rwk: 359°, d: 740 m
SO232/017-1	4/9/2014	11:14	35° 16,98' S	33° 16,03' E	3057.2	Kettensack- dredge	Beginn dredgen	SLmax: 3849 m
SO232/017-1	4/9/2014	11:54	35° 17,03' S	33° 16,15' E	3163.3	Kettensack- dredge	frei vom Grund	SL: 3058 m, SZmax: 36,9 kN
SO232/017-1	4/9/2014	12:59	35° 17,08' S	33° 16,05' E	3370	Kettensack- dredge	a.D.	
SO232/017-1	4/9/2014	13:08	35° 17,06' S	33° 16,10' E	3200.5	Kettensack- dredge	Stationsende	

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/018-1	4/9/2014	14:36	35° 11,64' S	33° 3,94' E	3054.2	Kettensack-dredge	Stationsbeginn	
SO232/018-1	4/9/2014	14:39	35° 11,64' S	33° 3,96' E	3078.4	Kettensack-dredge	z.W.	W 6
SO232/018-1	4/9/2014	15:34	35° 11,62' S	33° 4,09' E	3036.6	Kettensack-dredge	Boko	SL: 3071 m
SO232/018-1	4/9/2014	15:35	35° 11,62' S	33° 4,09' E	3033.2	Kettensack-dredge	Auslegen	rwk: 357°, d: 761 m
SO232/018-1	4/9/2014	16:05	35° 11,16' S	33° 4,09' E	2675.8	Kettensack-dredge	Beginn dredgen	SLmax: 3450 m
SO232/018-1	4/9/2014	16:53	35° 11,16' S	33° 4,11' E	2661.5	Kettensack-dredge	frei vom Grund	SL: 2598 m, SZmax: 52 kN
SO232/018-1	4/9/2014	17:43	35° 11,15' S	33° 4,10' E	2646	Kettensack-dredge	a.D.	
SO232/018-1	4/9/2014	17:54	35° 11,17' S	33° 4,00' E	2660.8	Kettensack-dredge	Stationsende	
SO232/019-1	4/9/2014	19:26	35° 5,07' S	32° 51,57' E	3168	Kettensack-dredge	Stationsbeginn	
SO232/019-1	4/9/2014	19:27	35° 5,06' S	32° 51,58' E	3148	Kettensack-dredge	z.W.	W 6
SO232/019-1	4/9/2014	20:22	35° 5,05' S	32° 51,64' E	3081.5	Kettensack-dredge	Boko	SL: 3145 m
SO232/019-1	4/9/2014	20:23	35° 5,05' S	32° 51,63' E	3132	Kettensack-dredge	Auslegen	rwk: 001°, d: 815 m
SO232/019-1	4/9/2014	20:58	35° 4,55' S	32° 51,64' E	2572.8	Kettensack-dredge	Beginn dredgen	SLmax: 3500 m
SO232/019-1	4/9/2014	21:37	35° 4,53' S	32° 51,64' E	2573.8	Kettensack-dredge	KD hakt	SZmax: 93,6 kN
SO232/019-1	4/9/2014	21:52	35° 4,52' S	32° 51,64' E	2574	Kettensack-dredge	frei vom Grund	SL: 2545 m
SO232/019-1	4/9/2014	22:39	35° 4,55' S	32° 51,61' E	2573.2	Kettensack-dredge	a.D.	
SO232/019-1	4/9/2014	22:49	35° 4,71' S	32° 51,53' E	2675.4	Kettensack-dredge	Stationsende	
SO232/020-1	4/10/2014	1:46	35° 20,84' S	32° 42,42' E	4215.4	Kettensack-dredge	Stationsbeginn	
SO232/020-1	4/10/2014	2:02	35° 20,82' S	32° 42,44' E	4202.1	Kettensack-dredge	z.W.	W 6
SO232/020-1	4/10/2014	3:23	35° 20,77' S	32° 42,49' E	4173.4	Kettensack-dredge	Boko	SL: 4204 m
SO232/020-1	4/10/2014	3:24	35° 20,77' S	32° 42,50' E	4184.4	Kettensack-dredge	Auslegen	rwk: 021°, d: 949 m
SO232/020-1	4/10/2014	4:03	35° 20,25' S	32° 42,76' E	3700.9	Kettensack-dredge	Beginn dredgen	SLmax: 4600 m
SO232/020-1	4/10/2014	4:51	35° 20,23' S	32° 42,76' E	3745.6	Kettensack-dredge	frei vom Grund	SL: 3722 m, SZmax: 52 kN
SO232/020-1	4/10/2014	6:03	35° 20,20' S	32° 42,80' E	3651.8	Kettensack-dredge	a.D.	
SO232/020-1	4/10/2014	6:09	35° 20,21' S	32° 42,79' E	3756.3	Kettensack-dredge	Stationsende	
SO232/021-1	4/10/2014	12:40	34° 48,74' S	31° 56,59' E	3869.9	Kettensack-dredge	Stationsbeginn	
SO232/021-1	4/10/2014	12:41	34° 48,72' S	31° 56,59' E	3871.2	Kettensack-dredge	z.W.	W 6
SO232/021-1	4/10/2014	14:00	34° 48,46' S	31° 56,58' E	3827.5	Kettensack-dredge	Boko	SL: 3824 m
SO232/021-1	4/10/2014	14:01	34° 48,44' S	31° 56,57' E	3791.1	Kettensack-dredge	Auslegen	rwk: 002°, d: 815 m
SO232/021-1	4/10/2014	14:24	34° 48,03' S	31° 56,63' E	3416.5	Kettensack-dredge	Beginn dredgen	SLmax: 4150 m
SO232/021-1	4/10/2014	15:06	34° 48,08' S	31° 56,75' E	3427.2	Kettensack-dredge	frei vom Grund	SL: 3347 m, SZmax: 44 kN
SO232/021-1	4/10/2014	16:10	34° 47,90' S	31° 56,87' E	3502.8	Kettensack-dredge	a.D.	
SO232/021-1	4/10/2014	16:17	34° 47,93' S	31° 56,89' E	3520.6	Kettensack-dredge	Stationsende	
SO232/022-1	4/10/2014	16:18	34° 47,93' S	31° 56,90' E	3523.3	Profil	Stationsbeginn	AWI-20140205

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/022-1	4/10/2014	16:36	34° 47,75' S	31° 57,01' E	3523.6	Profil	Streamerendboje z.W.	
SO232/022-1	4/10/2014	16:46	34° 47,37' S	31° 57,49' E	3356.2	Profil	Bird z. W.	Nr. 01
SO232/022-1	4/10/2014	18:12	34° 43,78' S	32° 1,93' E	3548.4	Profil	Bird z. W.	Nr. 12
SO232/022-1	4/10/2014	18:22	34° 43,40' S	32° 2,39' E	3506.9	Profil	Streamer zu Wasser	SL: 3000 m
SO232/022-1	4/10/2014	18:41	34° 42,66' S	32° 3,30' E	3426.1	Profil	Bb-Airgunarray zu Wasser	
SO232/022-1	4/10/2014	18:47	34° 42,44' S	32° 3,57' E	3434.4	Profil	Airgun eingeschaltet	
SO232/022-1	4/10/2014	18:49	34° 42,35' S	32° 3,67' E	3424.5	Profil	Beginn Profil	rwk: 045°, d: 28 nm
SO232/022-1	4/11/2014	0:42	34° 21,38' S	32° 29,72' E	2545.2	Profil	Ende Profil	
SO232/022-1	4/11/2014	0:42	34° 21,38' S	32° 29,72' E	2545.2	Profil	Stationsende	
SO232/023-1	4/11/2014	1:51	34° 22,77' S	32° 27,43' E	2621.9	Profil	Stationsbeginn	AWI-20140206
SO232/023-1	4/11/2014	1:51	34° 22,77' S	32° 27,43' E	2621.9	Profil	Beginn Profil	rwk: 205°, d: 85 nm
SO232/023-1	4/11/2014	20:52	35° 39,60' S	31° 43,35' E	4364.4	Profil	Airgun abgeschaltet	
SO232/023-1	4/11/2014	20:55	35° 39,81' S	31° 43,22' E	4369.7	Profil	Ende Profil	
SO232/023-1	4/11/2014	20:55	35° 39,81' S	31° 43,22' E	4369.7	Profil	Stationsende	
SO232/024-1	4/11/2014	21:28	35° 39,00' S	31° 42,02' E	4368.7	Profil	Stationsbeginn	AWI-20140207
SO232/024-1	4/11/2014	21:28	35° 39,00' S	31° 42,02' E	4368.7	Profil	Beginn Profil	rwk: 063°, d: 90 nm
SO232/024-1	4/11/2014	21:32	35° 38,85' S	31° 42,39' E	4367.7	Profil	Airgun eingeschaltet	
SO232/024-1	4/12/2014	16:55	34° 57,93' S	33° 20,01' E	2836.9	Profil	Ende Profil	
SO232/024-1	4/12/2014	16:55	34° 57,93' S	33° 20,01' E	2836.9	Profil	Stationsende	
SO232/025-1	4/12/2014	17:34	34° 59,51' S	33° 20,12' E	2716.4	Profil	Stationsbeginn	AWI-20140208
SO232/025-1	4/12/2014	17:34	34° 59,51' S	33° 20,12' E	2716.4	Profil	Airgun eingeschaltet	
SO232/025-1	4/12/2014	17:34	34° 59,51' S	33° 20,12' E	2716.4	Profil	Beginn Profil	rwk: 287°, d: 102 nm
SO232/025-1	4/13/2014	13:53	34° 29,11' S	31° 21,26' E	4091.5	Profil	Airgun abgeschaltet	
SO232/025-1	4/13/2014	13:53	34° 29,11' S	31° 21,26' E	4091.5	Profil	Ende Profil	
SO232/025-1	4/13/2014	13:53	34° 29,11' S	31° 21,26' E	4091.5	Profil	Stationsende	
SO232/026-1	4/13/2014	14:40	34° 29,46' S	31° 20,50' E	4082.4	Profil	Stationsbeginn	AWI-20140209
SO232/026-1	4/13/2014	14:40	34° 29,46' S	31° 20,50' E	4082.4	Profil	Bb-Airgunarray zu Wasser	
SO232/026-1	4/13/2014	14:40	34° 29,46' S	31° 20,50' E	4082.4	Profil	Beginn Profil	rwk: 096°, d: 57 nm
SO232/026-1	4/14/2014	2:16	34° 35,32' S	32° 28,91' E	2733.9	Profil	Ende Profil	
SO232/026-1	4/14/2014	2:16	34° 35,32' S	32° 28,91' E	2733.9	Profil	Stationsende	
SO232/027-1	4/14/2014	3:12	34° 36,91' S	32° 28,56' E	14.7	Profil	Stationsbeginn	AWI-20140210
SO232/027-1	4/14/2014	3:12	34° 36,91' S	32° 28,56' E	14.7	Profil	Beginn Profil	rwk: 316°, d: 64 nm
SO232/027-1	4/14/2014	16:14	33° 50,96' S	31° 34,70' E	3938.4	Profil	Ende Profil	
SO232/027-1	4/14/2014	16:14	33° 50,96' S	31° 34,70' E	3938.4	Profil	Stationsende	
SO232/028-1	4/14/2014	17:00	33° 52,39' S	31° 33,90' E	3957.7	Profil	Stationsbeginn	AWI-20140211

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/028-1	4/14/2014	17:00	33° 52,39' S	31° 33,90' E	3957.7	Profil	Beginn Profil	rwk: 092°, d: 234 nm
SO232/028-1	4/16/2014	19:04	34° 0,26' S	36° 15,61' E	4332	Profil	Ende Profil	
SO232/028-1	4/16/2014	19:04	34° 0,26' S	36° 15,61' E	4332	Profil	Airgun abgeschaltet	
SO232/028-1	4/16/2014	19:18	34° 0,21' S	36° 16,43' E	4675	Profil	Bb-Airgunarray an Deck	
SO232/028-1	4/16/2014	19:21	34° 0,20' S	36° 16,59' E	4666	Profil	Beginn hieven Streamer	
SO232/028-1	4/16/2014	19:39	34° 0,19' S	36° 17,59' E	4694.6	Profil	Bird a. D.	Nr. 01
SO232/028-1	4/16/2014	22:17	33° 59,96' S	36° 27,23' E	4399.5	Profil	Bird a. D.	Nr. 12
SO232/028-1	4/16/2014	22:21	33° 59,96' S	36° 27,45' E	4380.1	Profil	Streamer an Deck	
SO232/028-1	4/16/2014	22:21	33° 59,96' S	36° 27,45' E	4380.1	Profil	Stationsende	
SO232/029-1	4/17/2014	2:20	34° 4,43' S	36° 13,60' E	3803.2	Kettensack-dredge	Stationsbeginn	
SO232/029-1	4/17/2014	2:24	34° 4,49' S	36° 13,60' E	3799.4	Kettensack-dredge	z.W.	W 6
SO232/029-1	4/17/2014	3:37	34° 4,53' S	36° 13,63' E	3807.2	Kettensack-dredge	Boko	SL: 3832 m
SO232/029-1	4/17/2014	3:38	34° 4,53' S	36° 13,62' E	3800.3	Kettensack-dredge	Auslegen	rwk: 214°, d: 651 m
SO232/029-1	4/17/2014	4:10	34° 4,86' S	36° 13,32' E	3396.1	Kettensack-dredge	Beginn dredgen	SLmax: 4150 m
SO232/029-1	4/17/2014	4:33	34° 4,82' S	36° 13,34' E	3401.4	Kettensack-dredge	KD hakt	SL: 3752 m, SZmax: 90 kN
SO232/029-1	4/17/2014	5:07	34° 4,84' S	36° 13,38' E	3413.3	Kettensack-dredge	frei vom Grund	SL: 3358 m
SO232/029-1	4/17/2014	6:16	34° 4,78' S	36° 13,36' E	0	Kettensack-dredge	a.D.	
SO232/029-1	4/17/2014	6:25	34° 4,79' S	36° 13,37' E	0	Kettensack-dredge	Stationsende	
SO232/030-1	4/17/2014	7:00	34° 2,86' S	36° 14,21' E	4156.4	Kettensack-dredge	Stationsbeginn	
SO232/030-1	4/17/2014	7:03	34° 2,87' S	36° 14,22' E	4169.9	Kettensack-dredge	z.W.	W 6
SO232/030-1	4/17/2014	8:22	34° 2,85' S	36° 14,24' E	4184.3	Kettensack-dredge	Boko	SL: 4143 m
SO232/030-1	4/17/2014	8:23	34° 2,85' S	36° 14,24' E	4208.8	Kettensack-dredge	Auslegen	rwk: 228°, d: 603 m
SO232/030-1	4/17/2014	8:49	34° 3,08' S	36° 13,91' E	3856.5	Kettensack-dredge	Beginn dredgen	SLmax: 4450 m
SO232/030-1	4/17/2014	9:22	34° 3,09' S	36° 13,94' E	3876.8	Kettensack-dredge	frei vom Grund	SL: 3808 m, SZmax: 58,3 kN
SO232/030-1	4/17/2014	10:51	34° 3,09' S	36° 13,96' E	0	Kettensack-dredge	a.D.	
SO232/030-1	4/17/2014	11:07	34° 3,11' S	36° 14,00' E	0	Kettensack-dredge	Stationsende	
SO232/031-1	4/17/2014	13:11	33° 57,81' S	36° 17,45' E	4748.7	Kettensack-dredge	Stationsbeginn	
SO232/031-1	4/17/2014	13:11	33° 57,81' S	36° 17,45' E	4748.7	Kettensack-dredge	z.W.	W 6
SO232/031-1	4/17/2014	14:46	33° 57,83' S	36° 17,44' E	4753.3	Kettensack-dredge	Boko	SL: 4725 m
SO232/031-1	4/17/2014	14:47	33° 57,84' S	36° 17,46' E	4736.7	Kettensack-dredge	Auslegen	rwk: 221°, d: 636 m
SO232/031-1	4/17/2014	15:18	33° 58,11' S	36° 17,15' E	4399.4	Kettensack-dredge	Beginn dredgen	SLmax: 5050 m
SO232/031-1	4/17/2014	15:57	33° 58,15' S	36° 17,18' E	4451	Kettensack-dredge	frei vom Grund	SL: 4388 m, SZmax: 62 kN
SO232/031-1	4/17/2014	17:31	33° 58,06' S	36° 17,04' E	4425.7	Kettensack-dredge	a.D.	
SO232/031-1	4/17/2014	17:39	33° 58,03' S	36° 17,07' E	4402.8	Kettensack-dredge	Stationsende	

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/032-1	4/17/2014	19:22	33° 49,17' S	36° 17,55' E	4180.9	Kettensack- dredge	Stationsbeginn	
SO232/032-1	4/17/2014	19:23	33° 49,18' S	36° 17,56' E	4143.4	Kettensack- dredge	z.W.	W 6
SO232/032-1	4/17/2014	20:41	33° 49,21' S	36° 17,59' E	4201.6	Kettensack- dredge	Boko	SL: 4169 m
SO232/032-1	4/17/2014	20:42	33° 49,22' S	36° 17,59' E	4187.3	Kettensack- dredge	Auslegen	rwk: 240°, d: 767 m
SO232/032-1	4/17/2014	21:14	33° 49,45' S	36° 17,16' E	3731.9	Kettensack- dredge	Beginn dredgen	SLmax: 4550 m
SO232/032-1	4/17/2014	22:06	33° 49,48' S	36° 17,18' E	3779.1	Kettensack- dredge	frei vom Grund	SL: 3667 m, SZmax: 65 kN
SO232/032-1	4/17/2014	23:19	33° 49,47' S	36° 17,21' E	3769.5	Kettensack- dredge	a.D.	
SO232/032-1	4/17/2014	23:29	33° 49,43' S	36° 17,13' E	3711.2	Kettensack- dredge	Stationsende	
SO232/033-1	4/18/2014	0:04	33° 49,00' S	36° 16,58' E	3510.2	Kettensack- dredge	Stationsbeginn	
SO232/033-1	4/18/2014	0:05	33° 49,00' S	36° 16,58' E	3518.3	Kettensack- dredge	z.W.	W 6
SO232/033-1	4/18/2014	1:06	33° 49,08' S	36° 16,54' E	3546	Kettensack- dredge	Boko	SL: 3506 m
SO232/033-1	4/18/2014	1:11	33° 49,11' S	36° 16,53' E	3478.8	Kettensack- dredge	Auslegen	rwk: 234°, d: 700 m
SO232/033-1	4/18/2014	1:45	33° 49,38' S	36° 16,06' E	2944	Kettensack- dredge	Beginn dredgen	SLmax: 3800 m
SO232/033-1	4/18/2014	2:32	33° 49,38' S	36° 16,11' E	2943.7	Kettensack- dredge	frei vom Grund	SL: 2923 m, SZmax: 76 kN
SO232/033-1	4/18/2014	3:29	33° 49,37' S	36° 16,16' E	2943.3	Kettensack- dredge	a.D.	
SO232/033-1	4/18/2014	3:38	33° 49,33' S	36° 16,10' E	2939.2	Kettensack- dredge	Stationsende	
SO232/034-1	4/18/2014	5:50	33° 37,38' S	36° 21,14' E	4276.3	Kettensack- dredge	Stationsbeginn	
SO232/034-1	4/18/2014	5:52	33° 37,36' S	36° 21,12' E	4279.7	Kettensack- dredge	z.W.	W 6
SO232/034-1	4/18/2014	7:13	33° 37,39' S	36° 21,17' E	4365	Kettensack- dredge	Boko	SL: 4304 m
SO232/034-1	4/18/2014	7:14	33° 37,39' S	36° 21,18' E	4347.6	Kettensack- dredge	Auslegen	rwk: 237°, d: 752 m
SO232/034-1	4/18/2014	7:39	33° 37,63' S	36° 20,77' E	3996.4	Kettensack- dredge	Beginn dredgen	SLmax: 4650 m
SO232/034-1	4/18/2014	8:03	33° 37,63' S	36° 20,74' E	3898.5	Kettensack- dredge	KD hakt	SL: 4024 m, SZmax: 114 kN
SO232/034-1	4/18/2014	8:33	33° 37,61' S	36° 20,77' E	0	Kettensack- dredge	frei vom Grund	SL: 3868 m
SO232/034-1	4/18/2014	10:00	33° 37,60' S	36° 20,78' E	3936.2	Kettensack- dredge	a.D.	
SO232/034-1	4/18/2014	10:06	33° 37,60' S	36° 20,78' E	3888.6	Kettensack- dredge	Stationsende	
SO232/035-1	4/18/2014	10:41	33° 35,60' S	36° 19,50' E	3203.9	Kettensack- dredge	Stationsbeginn	
SO232/035-1	4/18/2014	10:43	33° 35,62' S	36° 19,51' E	3206	Kettensack- dredge	z.W.	W 6
SO232/035-1	4/18/2014	11:45	33° 35,72' S	36° 19,54' E	3164.4	Kettensack- dredge	Boko	SL: 3200 m
SO232/035-1	4/18/2014	11:47	33° 35,76' S	36° 19,52' E	3148.9	Kettensack- dredge	Auslegen	rwk: 225°, d: 610 m
SO232/035-1	4/18/2014	12:13	33° 36,00' S	36° 19,29' E	2781.3	Kettensack- dredge	Beginn dredgen	SLmax: 3450 m
SO232/035-1	4/18/2014	12:24	33° 36,01' S	36° 19,23' E	2735	Kettensack- dredge	KD hakt	SL: 3230 m, SZ: 82,4 kN
SO232/035-1	4/18/2014	12:28	33° 36,00' S	36° 19,22' E	2683.6	Kettensack- dredge	KD hakt	SL: 3230 m, SZ: 80,5 kN
SO232/035-1	4/18/2014	12:46	33° 35,92' S	36° 19,38' E	2803.6	Kettensack- dredge	KD hakt	SL: 3205 m, SZ: 81,7 kN
SO232/035-1	4/18/2014	12:54	33° 35,81' S	36° 19,44' E	3120.1	Kettensack- dredge	KD hakt	SL: 3174 m, SZmax: 83,1 kN

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/035-1	4/18/2014	13:07	33° 35,77' S	36° 19,57' E	3163.2	Kettensack-dredge	frei vom Grund	SL: 3100 m
SO232/035-1	4/18/2014	14:07	33° 35,83' S	36° 19,55' E	3139.2	Kettensack-dredge	a.D.	
SO232/035-1	4/18/2014	14:12	33° 35,82' S	36° 19,51' E	3102.4	Kettensack-dredge	Stationsende	
SO232/036-1	4/18/2014	17:30	33° 13,14' S	36° 26,71' E	4248.8	Kettensack-dredge	Stationsbeginn	
SO232/036-1	4/18/2014	17:31	33° 13,14' S	36° 26,72' E	4251.6	Kettensack-dredge	z.W.	W 6
SO232/036-1	4/18/2014	18:57	33° 13,18' S	36° 26,74' E	4314.2	Kettensack-dredge	Boko	SL: 4330 m
SO232/036-1	4/18/2014	18:58	33° 13,18' S	36° 26,74' E	4330.2	Kettensack-dredge	Auslegen	rwk: 224°, d: 717 m
SO232/036-1	4/18/2014	19:29	33° 13,51' S	36° 26,38' E	4007.6	Kettensack-dredge	Beginn dredgen	SLmax: 4750 m
SO232/036-1	4/18/2014	20:12	33° 13,52' S	36° 26,39' E	3975.5	Kettensack-dredge	frei vom Grund	SL: 4005 m, SZmax: 59,1 kN
SO232/036-1	4/18/2014	21:38	33° 13,53' S	36° 26,35' E	4038.4	Kettensack-dredge	a.D.	
SO232/036-1	4/18/2014	21:46	33° 13,56' S	36° 26,33' E	4019.9	Kettensack-dredge	Stationsende	
SO232/037-1	4/18/2014	22:22	33° 11,01' S	36° 26,71' E	3831.9	Kettensack-dredge	Stationsbeginn	
SO232/037-1	4/18/2014	22:23	33° 11,02' S	36° 26,71' E	3830	Kettensack-dredge	z.W.	W 6
SO232/037-1	4/18/2014	23:34	33° 11,05' S	36° 26,64' E	3791.6	Kettensack-dredge	Boko	SL: 3817 m
SO232/037-1	4/18/2014	23:41	33° 11,13' S	36° 26,57' E	3721.5	Kettensack-dredge	Auslegen	rwk: 245°, d: 821 m
SO232/037-1	4/19/2014	0:10	33° 11,29' S	36° 26,11' E	3241.2	Kettensack-dredge	Beginn dredgen	SLmax: 4150 m
SO232/037-1	4/19/2014	0:53	33° 11,50' S	36° 26,27' E	3458.8	Kettensack-dredge	frei vom Grund	SL: 3405 m, SZmax: 46,2 kN
SO232/037-1	4/19/2014	2:00	33° 11,71' S	36° 27,16' E	4325.2	Kettensack-dredge	a.D.	
SO232/037-1	4/19/2014	2:12	33° 11,72' S	36° 27,26' E	4444.5	Kettensack-dredge	Stationsende	
SO232/038-1	4/19/2014	4:42	33° 0,00' S	36° 29,36' E	4330.9	Kettensack-dredge	Stationsbeginn	
SO232/038-1	4/19/2014	4:45	33° 0,00' S	36° 29,36' E	4327.2	Kettensack-dredge	z.W.	W 6
SO232/038-1	4/19/2014	6:09	32° 59,98' S	36° 29,31' E	4275.4	Kettensack-dredge	Boko	SL: 4358 m
SO232/038-1	4/19/2014	6:10	32° 59,98' S	36° 29,31' E	4246.9	Kettensack-dredge	Auslegen	rwk: 291°, d: 817 m
SO232/038-1	4/19/2014	6:39	32° 59,83' S	36° 28,82' E	3766.8	Kettensack-dredge	Beginn dredgen	SLmax: 4700 m
SO232/038-1	4/19/2014	7:34	32° 59,81' S	36° 28,68' E	3672.9	Kettensack-dredge	frei vom Grund	SL: 3675 m, SZmax: 64,9 kN
SO232/038-1	4/19/2014	8:54	32° 59,86' S	36° 28,82' E	3764.8	Kettensack-dredge	a.D.	
SO232/038-1	4/19/2014	9:00	32° 59,85' S	36° 28,82' E	3783.1	Kettensack-dredge	Stationsende	
SO232/039-1	4/19/2014	9:34	32° 57,40' S	36° 29,37' E	3826	Kettensack-dredge	Stationsbeginn	
SO232/039-1	4/19/2014	9:36	32° 57,42' S	36° 29,38' E	3815.7	Kettensack-dredge	z.W.	W 6
SO232/039-1	4/19/2014	10:48	32° 57,45' S	36° 29,42' E	3912.2	Kettensack-dredge	Boko	SL: 4100 m
SO232/039-1	4/19/2014	10:50	32° 57,45' S	36° 29,42' E	3878	Kettensack-dredge	Auslegen	rwk: 294°, d: 700 m
SO232/039-1	4/19/2014	11:23	32° 57,32' S	36° 28,92' E	3388	Kettensack-dredge	Beginn dredgen	SLmax: 4100 m
SO232/039-1	4/19/2014	12:09	32° 57,35' S	36° 28,92' E	3429.2	Kettensack-dredge	frei vom Grund	SL: 3303 m, SZmax: 54,7 kN
SO232/039-1	4/19/2014	13:17	32° 57,29' S	36° 28,89' E	3362.1	Kettensack-dredge	a.D.	

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/039-1	4/19/2014	13:28	32° 57,29' S	36° 28,90' E	3373.6	Kettensack- dredge	Stationsende	
SO232/040-1	4/19/2014	16:27	32° 42,18' S	36° 32,76' E	4003.3	Kettensack- dredge	Stationsbeginn	
SO232/040-1	4/19/2014	16:28	32° 42,18' S	36° 32,75' E	4010.7	Kettensack- dredge	z.W.	W 6
SO232/040-1	4/19/2014	17:44	32° 42,14' S	36° 32,77' E	4000.4	Kettensack- dredge	Boko	SL: 3964 m
SO232/040-1	4/19/2014	17:45	32° 42,15' S	36° 32,78' E	4051.4	Kettensack- dredge	Auslegen	rwk: 294°, d: 683 m
SO232/040-1	4/19/2014	18:17	32° 42,03' S	36° 32,35' E	3606.6	Kettensack- dredge	Beginn dredgen	SLmax: 4350 m
SO232/040-1	4/19/2014	19:02	32° 41,95' S	36° 32,21' E	3521.8	Kettensack- dredge	frei vom Grund	SL: 3515 m, SZmax: 53,2 kN
SO232/040-1	4/19/2014	20:16	32° 42,01' S	36° 32,21' E	3523.2	Kettensack- dredge	a.D.	
SO232/040-1	4/19/2014	20:26	32° 42,03' S	36° 32,22' E	3531.6	Kettensack- dredge	Stationsende	
SO232/041-1	4/19/2014	21:00	32° 45,83' S	36° 32,32' E	4239.2	Kettensack- dredge	Stationsbeginn	
SO232/041-1	4/19/2014	21:01	32° 45,83' S	36° 32,32' E	4313.4	Kettensack- dredge	z.W.	W 6
SO232/041-1	4/19/2014	22:15	32° 45,86' S	36° 32,33' E	4306.8	Kettensack- dredge	Boko	SL: 4298 m
SO232/041-1	4/19/2014	22:16	32° 45,86' S	36° 32,34' E	4268	Kettensack- dredge	Auslegen	rwk: 233°, d: 700 m
SO232/041-1	4/19/2014	22:53	32° 46,18' S	36° 31,95' E	3915.3	Kettensack- dredge	Beginn dredgen	SLmax: 4600 m
SO232/041-1	4/19/2014	23:38	32° 46,24' S	36° 31,90' E	3928.8	Kettensack- dredge	frei vom Grund	SL: 3884 m, SZmax: 62,5 kN
SO232/041-1	4/20/2014	0:56	32° 46,68' S	36° 31,96' E	4190.1	Kettensack- dredge	a.D.	
SO232/041-1	4/20/2014	1:08	32° 46,83' S	36° 32,03' E	4230.8	Kettensack- dredge	Stationsende	
SO232/042-1	4/20/2014	4:00	32° 33,54' S	36° 34,89' E	4382	Kettensack- dredge	Stationsbeginn	
SO232/042-1	4/20/2014	4:02	32° 33,54' S	36° 34,90' E	4368.6	Kettensack- dredge	z.W.	W 6
SO232/042-1	4/20/2014	5:26	32° 33,56' S	36° 34,82' E	4284.2	Kettensack- dredge	Boko	SL: 4340 m
SO232/042-1	4/20/2014	5:27	32° 33,55' S	36° 34,82' E	4299.9	Kettensack- dredge	Auslegen	rwk: 230°, d: 895 m
SO232/042-1	4/20/2014	6:06	32° 33,83' S	36° 34,26' E	3894.4	Kettensack- dredge	Beginn dredgen	SLmax: 4700 m
SO232/042-1	4/20/2014	7:00	32° 33,93' S	36° 34,30' E	3759.4	Kettensack- dredge	frei vom Grund	SL: 3728 m, SZmax: 56 kN
SO232/042-1	4/20/2014	8:31	32° 33,91' S	36° 34,51' E	4004.7	Kettensack- dredge	a.D.	
SO232/042-1	4/20/2014	8:40	32° 33,90' S	36° 34,51' E	4014.8	Kettensack- dredge	Stationsende	
SO232/043-1	4/20/2014	9:05	32° 35,75' S	36° 35,64' E	4625.8	Kettensack- dredge	Stationsbeginn	
SO232/043-1	4/20/2014	9:07	32° 35,75' S	36° 35,64' E	4594.6	Kettensack- dredge	z.W.	W 6
SO232/043-1	4/20/2014	10:41	32° 35,75' S	36° 35,63' E	4698	Kettensack- dredge	Boko	SL: 4713 m
SO232/043-1	4/20/2014	10:44	32° 35,75' S	36° 35,62' E	4663.6	Kettensack- dredge	Auslegen	rwk: 315°, d: 680 m
SO232/043-1	4/20/2014	11:15	32° 35,51' S	36° 35,17' E	4270.4	Kettensack- dredge	Beginn dredgen	SL: 5050 m
SO232/043-1	4/20/2014	12:01	32° 35,45' S	36° 35,17' E	4222.7	Kettensack- dredge	frei vom Grund	SL: 4200 m, SZmax: 52,9 kN
SO232/043-1	4/20/2014	13:33	32° 35,16' S	36° 35,01' E	4256	Kettensack- dredge	a.D.	
SO232/043-1	4/20/2014	13:42	32° 35,15' S	36° 35,04' E	4253.8	Kettensack- dredge	Stationsende	
SO232/044-1	4/20/2014	17:10	32° 20,74' S	36° 35,88' E	3150.9	Kettensack- dredge	Stationsbeginn	

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/044-1	4/20/2014	17:11	32° 20,74' S	36° 35,87' E	3200.2	Kettensack-dredge	z.W.	W 6
SO232/044-1	4/20/2014	18:07	32° 20,72' S	36° 35,89' E	3195.2	Kettensack-dredge	Boko	SL: 3187 m
SO232/044-1	4/20/2014	18:08	32° 20,72' S	36° 35,89' E	3202.8	Kettensack-dredge	Auslegen	rwk: 294°, d: 757 m
SO232/044-1	4/20/2014	18:43	32° 20,49' S	36° 35,37' E	2769.7	Kettensack-dredge	Beginn dredgen	SLmax: 3525 m
SO232/044-1	4/20/2014	19:26	32° 20,45' S	36° 35,31' E	2759.8	Kettensack-dredge	frei vom Grund	SL: 2740 m, SZmax: 59,6 kN
SO232/044-1	4/20/2014	20:20	32° 20,42' S	36° 35,31' E	2751.4	Kettensack-dredge	a.D.	
SO232/044-1	4/20/2014	20:32	32° 20,44' S	36° 35,35' E	2760.2	Kettensack-dredge	Stationsende	
SO232/045-1	4/20/2014	20:52	32° 20,43' S	36° 35,29' E	2750	Profil	Stationsbeginn	AWI-20140212
SO232/045-1	4/20/2014	20:54	32° 20,52' S	36° 35,20' E	2735.3	Profil	Streamerendboje z.W.	
SO232/045-1	4/20/2014	20:55	32° 20,57' S	36° 35,15' E	2735.5	Profil	Streamer zu Wasser	
SO232/045-1	4/20/2014	21:00	32° 20,81' S	36° 34,91' E	2793	Profil	Bird z. W.	Nr. 01
SO232/045-1	4/20/2014	22:37	32° 25,17' S	36° 30,45' E	3153.1	Profil	Bird z. W.	Nr. 12
SO232/045-1	4/20/2014	23:07	32° 26,42' S	36° 29,12' E	3112.8	Profil	Bb-Airgunarray zu Wasser	
SO232/045-1	4/20/2014	23:55	32° 28,82' S	36° 26,57' E	2921.2	Profil	Airgun Soft Start	
SO232/045-1	4/20/2014	23:59	32° 29,05' S	36° 26,32' E	2929.4	Profil	Airgun Soft Start	
SO232/045-1	4/21/2014	0:05	32° 29,46' S	36° 25,88' E	2896.2	Profil	Airgun Soft Start	
SO232/045-1	4/21/2014	0:10	32° 29,82' S	36° 25,53' E	2873.3	Profil	Airgun Soft Start	
SO232/045-1	4/21/2014	0:10	32° 29,82' S	36° 25,53' E	2873.3	Profil	Beginn Profil	rwk: 221°, d: 128 nm
SO232/045-1	4/22/2014	1:48	34° 4,63' S	34° 45,84' E	2559.2	Profil	Airgun abgeschaltet	
SO232/045-1	4/22/2014	1:48	34° 4,63' S	34° 45,84' E	2559.2	Profil	Ende Profil	
SO232/045-1	4/22/2014	1:48	34° 4,63' S	34° 45,84' E	2559.2	Profil	Stationsende	
SO232/046-1	4/22/2014	3:05	34° 4,51' S	34° 49,56' E	2598	Profil	Stationsbeginn	AWI-20140213
SO232/046-1	4/22/2014	3:05	34° 4,51' S	34° 49,56' E	2598	Profil	Bb-Airgunarray zu Wasser	
SO232/046-1	4/22/2014	3:05	34° 4,51' S	34° 49,56' E	2598	Profil	Beginn Profil	rwk: 308°, d: 50 nm
SO232/046-1	4/22/2014	12:36	33° 34,11' S	34° 2,23' E	2557.2	Profil	Ende Profil	
SO232/046-1	4/22/2014	12:36	33° 34,11' S	34° 2,23' E	2557.2	Profil	Stationsende	
SO232/047-1	4/22/2014	12:37	33° 34,06' S	34° 2,16' E	2557.2	Profil	Stationsbeginn	AWI-20140214
SO232/047-1	4/22/2014	12:37	33° 34,06' S	34° 2,16' E	2557.2	Profil	Beginn Profil	rwk: 290°, d: 64 nm
SO232/047-1	4/23/2014	1:31	33° 12,17' S	32° 50,18' E	3495	Profil	Airgun abgeschaltet	
SO232/047-1	4/23/2014	1:31	33° 12,17' S	32° 50,18' E	3495	Profil	Ende Profil	
SO232/047-1	4/23/2014	1:31	33° 12,17' S	32° 50,18' E	3495	Profil	Stationsende	
SO232/048-1	4/23/2014	2:03	33° 13,10' S	32° 50,17' E	3449.4	Profil	Stationsbeginn	AWI-20140215
SO232/048-1	4/23/2014	2:03	33° 13,10' S	32° 50,17' E	3449.4	Profil	Beginn Profil	rwk: 085°, d: 72 nm
SO232/048-1	4/23/2014	2:06	33° 13,08' S	32° 50,46' E	3479.1	Profil	Airgun Soft Start	
SO232/048-1	4/23/2014	17:35	33° 6,69' S	34° 15,30' E	1853.3	Profil	Ende Profil	

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/048-1	4/23/2014	17:35	33° 6,69' S	34° 15,30' E	1853.3	Profil	Stationsende	
SO232/049-1	4/23/2014	17:36	33° 6,69' S	34° 15,39' E	1844.4	Profil	Stationsbeginn	AWI-20140216
SO232/049-1	4/23/2014	17:36	33° 6,69' S	34° 15,39' E	1844.4	Profil	Beginn Profil	rwk: 100°, d: 100 nm
SO232/049-1	4/24/2014	15:51	33° 24,55' S	36° 12,98' E	2568.4	Profil	Ende Profil	
SO232/049-1	4/24/2014	15:51	33° 24,55' S	36° 12,98' E	2568.4	Profil	Stationsende	
SO232/050-1	4/24/2014	16:30	33° 25,56' S	36° 13,77' E	2511.2	Profil	Stationsbeginn	AWI-20140217
SO232/050-1	4/24/2014	16:30	33° 25,56' S	36° 13,77' E	2511.2	Profil	Beginn Profil	rwk: 298°, d: 149 nm
SO232/050-1	4/24/2014	16:41	33° 25,17' S	36° 12,87' E	2585	Profil	Airgun Soft Start	
SO232/050-1	4/25/2014	11:21	32° 42,22' S	34° 36,84' E	1568.4	Profil	Airgun abgeschaltet	
SO232/050-1	4/25/2014	11:30	32° 41,80' S	34° 35,93' E	1576.6	Profil	Airgun eingeschaltet	
SO232/050-1	4/25/2014	21:49	32° 15,73' S	33° 37,99' E	3420.4	Profil	Ende Profil	
SO232/050-1	4/25/2014	21:49	32° 15,73' S	33° 37,99' E	3420.4	Profil	Airgun abgeschaltet	
SO232/050-1	4/25/2014	22:06	32° 15,24' S	33° 37,12' E	3438.1	Profil	Bb-Airgunarray an Deck	
SO232/050-1	4/25/2014	22:19	32° 15,67' S	33° 36,33' E	3441.6	Profil	Beginn hieven Streamer	
SO232/050-1	4/25/2014	22:30	32° 16,18' S	33° 36,17' E	3443.5	Profil	Bird a. D.	Nr. 01
SO232/050-1	4/26/2014	1:08	32° 23,88' S	33° 33,65' E	3464.3	Profil	Bird a. D.	Nr. 12
SO232/050-1	4/26/2014	1:12	32° 24,08' S	33° 33,59' E	3463.8	Profil	Streamerendboje a. D.	
SO232/050-1	4/26/2014	1:14	32° 24,19' S	33° 33,56' E	3465.3	Profil	Stationsende	
SO232/051-1	4/26/2014	6:40	33° 11,39' S	33° 11,98' E	3509.6	Kettensack-dredge	Stationsbeginn	
SO232/051-1	4/26/2014	6:44	33° 11,40' S	33° 11,98' E	3498.3	Kettensack-dredge	z.W.	W 6
SO232/051-1	4/26/2014	7:47	33° 11,45' S	33° 12,02' E	3425.5	Kettensack-dredge	Boko	SL: 3482 m
SO232/051-1	4/26/2014	7:48	33° 11,45' S	33° 12,02' E	3441.2	Kettensack-dredge	Auslegen	rwk: 167°, d: 854 m
SO232/051-1	4/26/2014	8:21	33° 11,93' S	33° 12,07' E	3070.8	Kettensack-dredge	Beginn dredgen	SLmax: 3900 m
SO232/051-1	4/26/2014	9:08	33° 11,93' S	33° 12,09' E	3004.4	Kettensack-dredge	frei vom Grund	SL: 2979 m, SZmax: 47,0 kN
SO232/051-1	4/26/2014	10:10	33° 11,98' S	33° 12,07' E	2998.7	Kettensack-dredge	a.D.	
SO232/051-1	4/26/2014	10:20	33° 11,93' S	33° 12,14' E	2978	Kettensack-dredge	Stationsende	
SO232/052-1	4/26/2014	13:03	33° 5,18' S	33° 29,16' E	3576.4	Kettensack-dredge	Stationsbeginn	
SO232/052-1	4/26/2014	13:03	33° 5,18' S	33° 29,16' E	3576.4	Kettensack-dredge	z.W.	W 6
SO232/052-1	4/26/2014	14:08	33° 5,12' S	33° 29,34' E	3581.4	Kettensack-dredge	Boko	SL: 3584 m
SO232/052-1	4/26/2014	14:20	33° 5,11' S	33° 29,34' E	3601.2	Kettensack-dredge	Auslegen	rwk: 178°, d: 704 m
SO232/052-1	4/26/2014	14:56	33° 5,55' S	33° 29,26' E	3344.1	Kettensack-dredge	Beginn dredgen	SLmax: 4000 m
SO232/052-1	4/26/2014	15:42	33° 5,53' S	33° 29,14' E	3358	Kettensack-dredge	frei vom Grund	SL: 3219 m, SZmax: 42 kN
SO232/052-1	4/26/2014	16:44	33° 5,56' S	33° 29,34' E	3271.8	Kettensack-dredge	a.D.	
SO232/052-1	4/26/2014	16:56	33° 5,50' S	33° 29,37' E	3268.8	Kettensack-dredge	Stationsende	
SO232/053-1	4/26/2014	17:24	33° 6,74' S	33° 30,73' E	2854.6	Kettensack-dredge	Stationsbeginn	

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/053-1	4/26/2014	17:26	33° 6,75' S	33° 30,73' E	2818.5	Kettensack-dredge	z.W.	W 6
SO232/053-1	4/26/2014	18:17	33° 6,68' S	33° 30,84' E	2907.8	Kettensack-dredge	Boko	SL: 2880 m
SO232/053-1	4/26/2014	18:19	33° 6,69' S	33° 30,84' E	2892.8	Kettensack-dredge	Auslegen	rwk: 212°, d: 950 m
SO232/053-1	4/26/2014	19:00	33° 7,16' S	33° 30,45' E	2482.4	Kettensack-dredge	Beginn dredgen	SLmax: 3220 m
SO232/053-1	4/26/2014	19:43	33° 7,28' S	33° 30,26' E	2393.9	Kettensack-dredge	frei vom Grund	SL: 2385 m, SZmax: 47,6 kN
SO232/053-1	4/26/2014	20:31	33° 7,18' S	33° 30,42' E	2435.7	Kettensack-dredge	a.D.	
SO232/053-1	4/26/2014	20:40	33° 7,18' S	33° 30,44' E	2432.5	Kettensack-dredge	Stationsende	
SO232/054-1	4/26/2014	23:49	33° 19,78' S	33° 50,47' E	2816.7	Kettensack-dredge	Stationsbeginn	
SO232/054-1	4/26/2014	23:52	33° 19,77' S	33° 50,46' E	2806.8	Kettensack-dredge	z.W.	W 6
SO232/054-1	4/27/2014	0:43	33° 19,52' S	33° 50,41' E	2774.8	Kettensack-dredge	Boko	SL: 2846 m
SO232/054-1	4/27/2014	0:46	33° 19,54' S	33° 50,37' E	2767.3	Kettensack-dredge	Auslegen	rwk: 280°, d: 892 m
SO232/054-1	4/27/2014	1:12	33° 19,60' S	33° 49,82' E	2380.4	Kettensack-dredge	Beginn dredgen	SLmax: 3300 m
SO232/054-1	4/27/2014	2:05	33° 19,63' S	33° 49,81' E	2375.2	Kettensack-dredge	frei vom Grund	SL: 2356 m, SZmax: 52,9 kN
SO232/054-1	4/27/2014	2:52	33° 19,55' S	33° 49,84' E	2376.8	Kettensack-dredge	a.D.	
SO232/054-1	4/27/2014	3:03	33° 19,59' S	33° 49,85' E	2373.5	Kettensack-dredge	Stationsende	
SO232/055-1	4/27/2014	9:30	32° 51,38' S	34° 55,96' E	1579.2	Kettensack-dredge	Stationsbeginn	
SO232/055-1	4/27/2014	9:32	32° 51,37' S	34° 55,96' E	1577.8	Kettensack-dredge	z.W.	W 6
SO232/055-1	4/27/2014	10:00	32° 51,40' S	34° 55,95' E	1580.8	Kettensack-dredge	Boko	SL: 1575 m
SO232/055-1	4/27/2014	10:01	32° 51,40' S	34° 55,95' E	1576.2	Kettensack-dredge	Auslegen	rwk: 186°, d: 708 m
SO232/055-1	4/27/2014	10:36	32° 51,77' S	34° 55,87' E	1343.2	Kettensack-dredge	Beginn dredgen	SLmax: 2000 m
SO232/055-1	4/27/2014	11:16	32° 51,78' S	34° 55,92' E	1342.7	Kettensack-dredge	frei vom Grund	SL: 1300 m, SZmax: 52,4 kN
SO232/055-1	4/27/2014	11:44	32° 51,76' S	34° 55,88' E	1345.5	Kettensack-dredge	a.D.	
SO232/055-1	4/27/2014	12:01	32° 51,83' S	34° 55,73' E	1346.8	Kettensack-dredge	Stationsende	
SO232/056-1	4/27/2014	13:27	32° 50,41' S	35° 0,22' E	1534	Kettensack-dredge	Stationsbeginn	
SO232/056-1	4/27/2014	13:28	32° 50,41' S	35° 0,22' E	1534	Kettensack-dredge	z.W.	W 6
SO232/056-1	4/27/2014	13:57	32° 50,32' S	35° 0,17' E	1515	Kettensack-dredge	Boko	SL: 1517 m
SO232/056-1	4/27/2014	13:58	32° 50,32' S	35° 0,17' E	1519	Kettensack-dredge	Auslegen	rwk: 189°, d: 600 m
SO232/056-1	4/27/2014	14:28	32° 50,94' S	35° 0,16' E	1363.8	Kettensack-dredge	Beginn dredgen	SLmax: 1900 m
SO232/056-1	4/27/2014	15:02	32° 50,96' S	35° 0,16' E	1367	Kettensack-dredge	frei vom Grund	SL: 1300 m, SZmax: 62 kN
SO232/056-1	4/27/2014	15:29	32° 50,89' S	35° 0,20' E	1352.3	Kettensack-dredge	a.D.	
SO232/056-1	4/27/2014	16:06	32° 50,87' S	35° 0,23' E	1348	Kettensack-dredge	Stationsende	
SO232/057-1	4/27/2014	17:30	32° 54,48' S	35° 8,36' E	1548.5	Kettensack-dredge	Stationsbeginn	
SO232/057-1	4/27/2014	17:32	32° 54,51' S	35° 8,35' E	1542.9	Kettensack-dredge	z.W.	W 6
SO232/057-1	4/27/2014	18:01	32° 54,51' S	35° 8,37' E	1562.8	Kettensack-dredge	Boko	SL: 1551 m

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/057-1	4/27/2014	18:02	32° 54,52' S	35° 8,37' E	1545.4	Kettensack- dredge	Auslegen	rwk: 188°, d: 749 m
SO232/057-1	4/27/2014	18:28	32° 54,92' S	35° 8,28' E	1299	Kettensack- dredge	Beginn dredgen	SLmax: 1900 m
SO232/057-1	4/27/2014	18:56	32° 54,96' S	35° 8,27' E	1298.4	Kettensack- dredge	KD hakt	SL: 1387 m, SZmax: 84,6 kN
SO232/057-1	4/27/2014	19:07	32° 54,96' S	35° 8,26' E	1301.3	Kettensack- dredge	frei vom Grund	SL: 1283 m
SO232/057-1	4/27/2014	19:34	32° 54,94' S	35° 8,26' E	1298.2	Kettensack- dredge	a.D.	
SO232/057-1	4/27/2014	19:42	32° 54,94' S	35° 8,26' E	1301	Kettensack- dredge	Stationsende	
SO232/058-1	4/27/2014	20:08	32° 53,81' S	35° 9,70' E	1556.8	Kettensack- dredge	Stationsbeginn	
SO232/058-1	4/27/2014	20:10	32° 53,81' S	35° 9,70' E	1550.3	Kettensack- dredge	z.W.	W 6
SO232/058-1	4/27/2014	20:38	32° 53,85' S	35° 9,67' E	1538.7	Kettensack- dredge	Boko	SL: 1553 m
SO232/058-1	4/27/2014	20:39	32° 53,86' S	35° 9,67' E	1542.2	Kettensack- dredge	Auslegen	rwk: 185°, d: 799 m
SO232/058-1	4/27/2014	21:06	32° 54,30' S	35° 9,65' E	1336	Kettensack- dredge	Beginn dredgen	SLmax: 1950 m
SO232/058-1	4/27/2014	21:40	32° 54,33' S	35° 9,60' E	1329.3	Kettensack- dredge	frei vom Grund	SL: 1320 m, SZmax: 69,7 kN
SO232/058-1	4/27/2014	22:06	32° 54,40' S	35° 9,66' E	1302.5	Kettensack- dredge	a.D.	
SO232/058-1	4/27/2014	22:12	32° 54,37' S	35° 9,64' E	1310.4	Kettensack- dredge	Stationsende	
SO232/059-1	4/28/2014	0:57	32° 45,03' S	35° 21,16' E	1255.4	Kettensack- dredge	Stationsbeginn	
SO232/059-1	4/28/2014	0:57	32° 45,03' S	35° 21,16' E	1255.4	Kettensack- dredge	z.W.	W 6
SO232/059-1	4/28/2014	1:23	32° 45,20' S	35° 21,16' E	1216	Kettensack- dredge	Boko	SL: 1233 m
SO232/059-1	4/28/2014	1:25	32° 45,22' S	35° 21,13' E	1211.4	Kettensack- dredge	Auslegen	rwk: 182°, d: 800 m
SO232/059-1	4/28/2014	1:56	32° 45,72' S	35° 21,08' E	1004.8	Kettensack- dredge	Beginn dredgen	SLmax: 1800 m
SO232/059-1	4/28/2014	2:20	32° 45,94' S	35° 21,08' E	1195.3	Kettensack- dredge	KD hakt	SL: 1596 m, SZmax: 85 kN
SO232/059-1	4/28/2014	5:24	32° 45,36' S	35° 21,02' E	1151.4	Kettensack- dredge	frei vom Grund	SL: 900 m
SO232/059-1	4/28/2014	6:04	32° 45,53' S	35° 21,77' E	1256.6	Kettensack- dredge	a.D.	
SO232/059-1	4/28/2014	6:15	32° 45,47' S	35° 22,05' E	1301.9	Kettensack- dredge	Stationsende	
SO232/060-1	4/28/2014	8:41	32° 38,71' S	35° 34,74' E	1773	Kettensack- dredge	Stationsbeginn	
SO232/060-1	4/28/2014	8:43	32° 38,71' S	35° 34,72' E	1772.8	Kettensack- dredge	z.W.	W 6
SO232/060-1	4/28/2014	9:25	32° 38,73' S	35° 34,72' E	1772.3	Kettensack- dredge	Boko	SL: 1774 m
SO232/060-1	4/28/2014	9:27	32° 38,73' S	35° 34,72' E	1761.8	Kettensack- dredge	Auslegen	rwk: 234°, d: 730 m
SO232/060-1	4/28/2014	9:56	32° 38,96' S	35° 34,31' E	1761.8	Kettensack- dredge	Beginn dredgen	SLmax: 2150 m
SO232/060-1	4/28/2014	10:16	32° 38,87' S	35° 34,29' E	1455.1	Kettensack- dredge	KD hakt	SL: 1834 m, SZ: 80 kN
SO232/060-1	4/28/2014	10:21	32° 38,86' S	35° 34,27' E	1456	Kettensack- dredge	KD hakt	SL: 1822 m, SZ: 80 kN
SO232/060-1	4/28/2014	10:26	32° 38,85' S	35° 34,27' E	1459.4	Kettensack- dredge	KD hakt	SL: 1843 m, SZmax: 84 kN
SO232/060-1	4/28/2014	10:50	32° 38,80' S	35° 34,63' E	1715.5	Kettensack- dredge	frei vom Grund	SL: 1430 m
SO232/060-1	4/28/2014	11:28	32° 38,95' S	35° 35,22' E	1744.8	Kettensack- dredge	a.D.	
SO232/060-1	4/28/2014	12:00	32° 39,29' S	35° 35,65' E	1696.2	Kettensack- dredge	Stationsende	

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/061-1	4/28/2014	12:32	32° 37,79' S	35° 32,75' E	1642.8	Kettensack-dredge	Stationsbeginn	
SO232/061-1	4/28/2014	12:35	32° 37,81' S	35° 32,73' E	1645	Kettensack-dredge	z.W.	W 6
SO232/061-1	4/28/2014	13:05	32° 37,85' S	35° 32,55' E	1602.6	Kettensack-dredge	Boko	SL: 1634 m
SO232/061-1	4/28/2014	13:05	32° 37,85' S	35° 32,55' E	1602.6	Kettensack-dredge	Auslegen	rwk: 214°, d: 733 m
SO232/061-1	4/28/2014	13:34	32° 38,20' S	35° 32,30' E	1278.7	Kettensack-dredge	Beginn dredgen	SLmax: 2000 m
SO232/061-1	4/28/2014	13:49	32° 38,30' S	35° 32,39' E	1272.4	Kettensack-dredge	KD hakt	SL: 1480 m, SZmax: 82 kN
SO232/061-1	4/28/2014	14:22	32° 38,26' S	35° 32,33' E	1283.6	Kettensack-dredge	frei vom Grund	SL: 1236 m
SO232/061-1	4/28/2014	14:48	32° 38,23' S	35° 32,21' E	1278.6	Kettensack-dredge	a.D.	
SO232/061-1	4/28/2014	15:00	32° 38,21' S	35° 32,17' E	1281.3	Kettensack-dredge	Stationsende	
SO232/062-1	4/29/2014	3:22	31° 7,40' S	36° 41,41' E	4432.7	Kettensack-dredge	Stationsbeginn	
SO232/062-1	4/29/2014	3:24	31° 7,39' S	36° 41,41' E	4495	Kettensack-dredge	z.W.	W 6
SO232/062-1	4/29/2014	5:07	31° 7,43' S	36° 41,41' E	4494	Kettensack-dredge	Boko	SL: 4520 m
SO232/062-1	4/29/2014	5:08	31° 7,42' S	36° 41,40' E	4463	Kettensack-dredge	Auslegen	rwk: 319°, d: 791 m
SO232/062-1	4/29/2014	5:40	31° 7,05' S	36° 41,04' E	4008.4	Kettensack-dredge	Beginn dredgen	SLmax: 4900 m
SO232/062-1	4/29/2014	6:31	31° 7,06' S	36° 41,05' E	4024.2	Kettensack-dredge	frei vom Grund	SL: 4005 m, SZmax: 50,2kN
SO232/062-1	4/29/2014	7:57	31° 7,06' S	36° 41,07' E	4004.8	Kettensack-dredge	a.D.	
SO232/062-1	4/29/2014	8:05	31° 7,06' S	36° 41,06' E	4006	Kettensack-dredge	Stationsende	
SO232/063-1	4/29/2014	11:42	30° 46,39' S	36° 43,02' E	3529.9	Kettensack-dredge	Stationsbeginn	
SO232/063-1	4/29/2014	11:44	30° 46,38' S	36° 42,98' E	3514	Kettensack-dredge	z.W.	W 6
SO232/063-1	4/29/2014	12:51	30° 46,29' S	36° 42,77' E	3436.4	Kettensack-dredge	Boko	SL: 3502 m
SO232/063-1	4/29/2014	12:51	30° 46,29' S	36° 42,77' E	3436.4	Kettensack-dredge	Auslegen	rwk: 311°, d: 760 m
SO232/063-1	4/29/2014	13:17	30° 46,00' S	36° 42,40' E	2920	Kettensack-dredge	Beginn dredgen	SLmax: 3800 m
SO232/063-1	4/29/2014	14:21	30° 46,00' S	36° 42,34' E	2850.6	Kettensack-dredge	frei vom Grund	SL: 2718 m, SZmax: 46,2 kN
SO232/063-1	4/29/2014	15:14	30° 46,01' S	36° 42,29' E	2762.2	Kettensack-dredge	a.D.	
SO232/063-1	4/29/2014	15:24	30° 46,06' S	36° 42,33' E	2869.8	Kettensack-dredge	Stationsende	
SO232/064-1	4/29/2014	15:45	30° 46,41' S	36° 41,95' E	2961.6	Kettensack-dredge	Stationsbeginn	
SO232/064-1	4/29/2014	15:48	30° 46,40' S	36° 41,90' E	2899.4	Kettensack-dredge	z.W.	W 6
SO232/064-1	4/29/2014	16:43	30° 46,41' S	36° 41,89' E	2886.3	Kettensack-dredge	Boko	SL: 2938 m
SO232/064-1	4/29/2014	16:44	30° 46,41' S	36° 41,88' E	2864.7	Kettensack-dredge	Auslegen	rwk: 316°, d: 740 m
SO232/064-1	4/29/2014	17:12	30° 46,10' S	36° 41,51' E	2500.2	Kettensack-dredge	Beginn dredgen	SLmax: 3250 m
SO232/064-1	4/29/2014	17:55	30° 46,11' S	36° 41,52' E	2493.5	Kettensack-dredge	frei vom Grund	SL: 2445 m, SZmax: 56 kN
SO232/064-1	4/29/2014	18:41	30° 46,08' S	36° 41,59' E	2525.5	Kettensack-dredge	a.D.	
SO232/064-1	4/29/2014	19:09	30° 46,09' S	36° 41,52' E	2484.8	Kettensack-dredge	Stationsende	
SO232/065-1	4/29/2014	21:16	30° 35,01' S	36° 54,15' E	5045.4	Kettensack-dredge	Stationsbeginn	

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/065-1	4/29/2014	21:21	30° 35,01' S	36° 54,11' E	4982.4	Kettensack-dredge	z.W.	W 6
SO232/065-1	4/29/2014	23:05	30° 35,03' S	36° 54,18' E	5070.4	Kettensack-dredge	Boko	SL: 5087 m
SO232/065-1	4/29/2014	23:05	30° 35,03' S	36° 54,18' E	5070.4	Kettensack-dredge	Auslegen	rwk: 321°, d: 900 m
SO232/065-1	4/29/2014	23:37	30° 34,55' S	36° 53,69' E	4471.6	Kettensack-dredge	Beginn dredgen	SLmax: 5450 m
SO232/065-1	4/30/2014	0:32	30° 34,64' S	36° 53,42' E	4415.4	Kettensack-dredge	frei vom Grund	SL: 4369 m, SZmax: 64,2 kN
SO232/065-1	4/30/2014	2:09	30° 35,67' S	36° 53,06' E	4457.8	Kettensack-dredge	a.D.	
SO232/065-1	4/30/2014	2:33	30° 35,88' S	36° 52,81' E	4027.3	Kettensack-dredge	Stationsende	
SO232/066-1	4/30/2014	3:50	30° 34,17' S	37° 2,99' E	4865.2	Kettensack-dredge	Stationsbeginn	
SO232/066-1	4/30/2014	3:52	30° 34,18' S	37° 3,00' E	4881.8	Kettensack-dredge	z.W.	W 6
SO232/066-1	4/30/2014	5:42	30° 34,21' S	37° 2,88' E	4820.4	Kettensack-dredge	Boko	SL: 4853 m
SO232/066-1	4/30/2014	5:43	30° 34,23' S	37° 2,88' E	4821.3	Kettensack-dredge	Auslegen	rwk: 303°, d: 646 m
SO232/066-1	4/30/2014	6:13	30° 33,94' S	37° 2,64' E	4575.8	Kettensack-dredge	Beginn dredgen	SLmax: 5100 m
SO232/066-1	4/30/2014	6:44	30° 33,74' S	37° 2,45' E	4574.5	Kettensack-dredge	frei vom Grund	SL: 4513 m, SZmax: 67,5 kN
SO232/066-1	4/30/2014	8:25	30° 33,92' S	37° 1,92' E	4688.8	Kettensack-dredge	a.D.	
SO232/066-1	4/30/2014	8:32	30° 33,92' S	37° 1,85' E	4712.4	Kettensack-dredge	Stationsende	
SO232/067-1	4/30/2014	9:25	30° 33,33' S	36° 53,54' E	4265.5	Kettensack-dredge	Stationsbeginn	
SO232/067-1	4/30/2014	9:26	30° 33,34' S	36° 53,52' E	4274.8	Kettensack-dredge	z.W.	W 6
SO232/067-1	4/30/2014	10:46	30° 33,61' S	36° 53,42' E	3947.9	Kettensack-dredge	Boko	SL: 3941 m
SO232/067-1	4/30/2014	11:10	30° 33,92' S	36° 52,96' E	3476.4	Kettensack-dredge	Auslegen	rwk: 215°, d: 750 m
SO232/067-1	4/30/2014	11:12	30° 33,92' S	36° 52,96' E	3484.6	Kettensack-dredge	Beginn dredgen	SLmax: 4301 m
SO232/067-1	4/30/2014	11:22	30° 33,94' S	36° 52,91' E	3453.9	Kettensack-dredge	KD hakt	SL: 4120 m, SZmax: 82,1 kN
SO232/067-1	4/30/2014	12:12	30° 33,88' S	36° 52,77' E	3313.2	Kettensack-dredge	frei vom Grund	SL: 3244 m
SO232/067-1	4/30/2014	13:18	30° 33,89' S	36° 52,73' E	3302.7	Kettensack-dredge	a.D.	
SO232/067-1	4/30/2014	13:24	30° 33,86' S	36° 52,76' E	3321.7	Kettensack-dredge	Stationsende	
SO232/068-1	5/1/2014	0:22	30° 53,27' S	35° 32,23' E	2255.6	Kettensack-dredge	Stationsbeginn	
SO232/068-1	5/1/2014	0:23	30° 53,27' S	35° 32,22' E	2258	Kettensack-dredge	z.W.	W 6
SO232/068-1	5/1/2014	1:05	30° 53,25' S	35° 32,20' E	2267	Kettensack-dredge	Boko	SL: 2266 m
SO232/068-1	5/1/2014	1:05	30° 53,25' S	35° 32,20' E	2267	Kettensack-dredge	Auslegen	rwk: 321°, d: 551 m
SO232/068-1	5/1/2014	1:33	30° 52,93' S	35° 31,88' E	1977.4	Kettensack-dredge	Beginn dredgen	SLmax: 2600 m
SO232/068-1	5/1/2014	2:08	30° 52,90' S	35° 31,83' E	1974.2	Kettensack-dredge	frei vom Grund	SL: 1939 m, SZmax: 38,2 kN
SO232/068-1	5/1/2014	2:48	30° 52,92' S	35° 31,80' E	1978.6	Kettensack-dredge	a.D.	
SO232/068-1	5/1/2014	2:55	30° 52,92' S	35° 31,80' E	1982	Kettensack-dredge	Stationsende	
SO232/069-1	5/1/2014	4:40	30° 57,77' S	35° 19,94' E	2563.8	Kettensack-dredge	Stationsbeginn	
SO232/069-1	5/1/2014	4:41	30° 57,76' S	35° 19,94' E	2557.2	Kettensack-dredge	z.W.	W 6

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/069-1	5/1/2014	5:30	30° 57,74' S	35° 19,91' E	2560.9	Kettensack-dredge	Boko	SL: 2570 m
SO232/069-1	5/1/2014	5:31	30° 57,75' S	35° 19,92' E	2560.4	Kettensack-dredge	Auslegen	rwk: 360°, d: 574 m
SO232/069-1	5/1/2014	5:58	30° 57,39' S	35° 19,92' E	2164.5	Kettensack-dredge	Beginn dredgen	SLmax: 2800 m
SO232/069-1	5/1/2014	6:31	30° 57,39' S	35° 19,93' E	2167.4	Kettensack-dredge	frei vom Grund	SL: 2118 m, SZmax: 34,5 kN
SO232/069-1	5/1/2014	7:12	30° 57,41' S	35° 19,93' E	2169.6	Kettensack-dredge	a.D.	
SO232/069-1	5/1/2014	7:17	30° 57,48' S	35° 19,93' E	2173.4	Kettensack-dredge	Stationsende	
SO232/070-1	5/1/2014	11:27	31° 27,97' S	35° 17,68' E	3103.3	Kettensack-dredge	Stationsbeginn	
SO232/070-1	5/1/2014	11:31	31° 28,01' S	35° 17,63' E	3105.7	Kettensack-dredge	z.W.	W 6
SO232/070-1	5/1/2014	12:23	31° 27,77' S	35° 17,66' E	3003.4	Kettensack-dredge	Boko	SL: 3048 m
SO232/070-1	5/1/2014	12:26	31° 27,76' S	35° 17,63' E	3051.2	Kettensack-dredge	Auslegen	rwk: 357°, d: 668 m
SO232/070-1	5/1/2014	12:48	31° 27,35' S	35° 17,60' E	2458.4	Kettensack-dredge	Beginn dredgen	SLmax: 3350 m
SO232/070-1	5/1/2014	13:43	31° 27,38' S	35° 17,62' E	2586.8	Kettensack-dredge	frei vom Grund	SL: 2290 m, SZmax: 48,5 kN
SO232/070-1	5/1/2014	14:28	31° 27,40' S	35° 17,62' E	2447.1	Kettensack-dredge	a.D.	
SO232/070-1	5/1/2014	14:42	31° 27,31' S	35° 17,62' E	2376.1	Kettensack-dredge	Stationsende	
SO232/071-1	5/1/2014	15:14	31° 27,18' S	35° 18,75' E	2625.1	Kettensack-dredge	Stationsbeginn	
SO232/071-1	5/1/2014	15:16	31° 27,18' S	35° 18,74' E	14.7	Kettensack-dredge	z.W.	W 6
SO232/071-1	5/1/2014	16:05	31° 27,17' S	35° 18,76' E	2623.5	Kettensack-dredge	Boko	SL: 2660 m
SO232/071-1	5/1/2014	16:06	31° 27,17' S	35° 18,76' E	2620.7	Kettensack-dredge	Auslegen	rwk: 310°, d: 577 m
SO232/071-1	5/1/2014	16:24	31° 26,94' S	35° 18,42' E	2282.1	Kettensack-dredge	Beginn dredgen	SLmax: 2920 m
SO232/071-1	5/1/2014	17:06	31° 26,94' S	35° 18,37' E	2279.6	Kettensack-dredge	frei vom Grund	SL: 2198 m, SZmax: 38 kN
SO232/071-1	5/1/2014	17:50	31° 27,42' S	35° 18,09' E	2590.4	Kettensack-dredge	a.D.	
SO232/071-1	5/1/2014	18:00	31° 27,67' S	35° 17,88' E	2901	Kettensack-dredge	Stationsende	
SO232/072-1	5/1/2014	23:04	31° 45,43' S	35° 33,22' E	2482.8	Kettensack-dredge	Stationsbeginn	
SO232/072-1	5/1/2014	23:04	31° 45,43' S	35° 33,22' E	2482.8	Kettensack-dredge	z.W.	W 6
SO232/072-1	5/1/2014	23:54	31° 45,51' S	35° 33,05' E	2484.4	Kettensack-dredge	Boko	SL: 2488 m
SO232/072-1	5/1/2014	23:54	31° 45,51' S	35° 33,05' E	2484.4	Kettensack-dredge	Auslegen	rwk: 266°, d: 805 m
SO232/072-1	5/2/2014	0:22	31° 45,56' S	35° 32,45' E	2098.7	Kettensack-dredge	Beginn dredgen	SLmax: 2850 m
SO232/072-1	5/2/2014	1:05	31° 45,60' S	35° 32,39' E	2128.3	Kettensack-dredge	frei vom Grund	SL: 2107 m, SZmax: 48,8 kN
SO232/072-1	5/2/2014	1:50	31° 45,93' S	35° 32,10' E	2150.4	Kettensack-dredge	a.D.	
SO232/072-1	5/2/2014	1:50	31° 45,93' S	35° 32,10' E	2150.4	Kettensack-dredge	Stationsende	
SO232/073-1	5/2/2014	2:42	31° 44,47' S	35° 30,87' E	2347.4	Kettensack-dredge	Stationsbeginn	
SO232/073-1	5/2/2014	2:44	31° 44,49' S	35° 30,89' E	2085.8	Kettensack-dredge	z.W.	W 6
SO232/073-1	5/2/2014	3:29	31° 44,54' S	35° 30,85' E	2086.4	Kettensack-dredge	Boko	SL: 2035 m
SO232/073-1	5/2/2014	3:30	31° 44,54' S	35° 30,86' E	2068.5	Kettensack-dredge	Auslegen	rwk: 234°, d: 818 m

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/073-1	5/2/2014	3:54	31° 44,72' S	35° 30,45' E	1770.2	Kettensack-dredge	Beginn dredgen	SLmax: 2400 m
SO232/073-1	5/2/2014	4:27	31° 44,85' S	35° 30,55' E	1843.6	Kettensack-dredge	frei vom Grund	SL: 1815 m, SZmax: 23 kN
SO232/073-1	5/2/2014	5:04	31° 44,83' S	35° 30,36' E	1821.7	Kettensack-dredge	a.D.	
SO232/073-1	5/2/2014	5:12	31° 44,84' S	35° 30,23' E	1874.4	Kettensack-dredge	Stationsende	
SO232/074-1	5/2/2014	6:00	31° 44,77' S	35° 33,03' E	2522.6	Kettensack-dredge	Stationsbeginn	
SO232/074-1	5/2/2014	6:02	31° 44,77' S	35° 33,03' E	2613.8	Kettensack-dredge	z.W.	W 6
SO232/074-1	5/2/2014	6:45	31° 44,73' S	35° 32,99' E	2426.9	Kettensack-dredge	Boko	SL: 2439 m
SO232/074-1	5/2/2014	6:45	31° 44,73' S	35° 32,99' E	2426.9	Kettensack-dredge	Auslegen	rwk: 270°, d: 613 m
SO232/074-1	5/2/2014	7:04	31° 44,77' S	35° 32,55' E	2174.7	Kettensack-dredge	Beginn dredgen	SLmax: 2700 m
SO232/074-1	5/2/2014	7:32	31° 44,80' S	35° 32,52' E	2166	Kettensack-dredge	frei vom Grund	SL: 2160 m, SZmax: 32,7 kN
SO232/074-1	5/2/2014	8:18	31° 44,91' S	35° 32,51' E	2251.3	Kettensack-dredge	a.D.	
SO232/074-1	5/2/2014	8:37	31° 45,16' S	35° 32,24' E	2201.6	Kettensack-dredge	Stationsende	
SO232/075-1	5/2/2014	8:40	31° 45,23' S	35° 32,10' E	2135	Profil	Stationsbeginn	AWI-20140218
SO232/075-1	5/2/2014	8:41	31° 45,24' S	35° 32,03' E	2109.3	Profil	Streamerendboje z.W.	
SO232/075-1	5/2/2014	8:45	31° 45,26' S	35° 31,76' E	2068.7	Profil	Bird z. W.	Nr. 01
SO232/075-1	5/2/2014	10:19	31° 45,08' S	35° 26,25' E	1889.2	Profil	Bird z. W.	Nr. 12
SO232/075-1	5/2/2014	10:58	31° 45,17' S	35° 23,85' E	1970.6	Profil	Bb-Airgunarray zu Wasser	
SO232/075-1	5/2/2014	11:03	31° 45,18' S	35° 23,54' E	1990.9	Profil	Airgun Soft Start	
SO232/075-1	5/2/2014	11:14	31° 45,20' S	35° 22,66' E	2064.8	Profil	Beginn Profil	rwk: 267°, d: 54 nm
SO232/075-1	5/2/2014	13:53	31° 45,76' S	35° 8,81' E	2432.4	Profil	Airgun abgeschaltet	
SO232/075-1	5/2/2014	14:00	31° 45,78' S	35° 8,16' E	2410.5	Profil	Airgun eingeschaltet	
SO232/075-1	5/2/2014	14:00	31° 45,78' S	35° 8,16' E	2410.5	Profil	Airgun abgeschaltet	
SO232/075-1	5/2/2014	14:07	31° 45,79' S	35° 7,51' E	2429.5	Profil	Airgun eingeschaltet	
SO232/075-1	5/2/2014	21:30	31° 47,60' S	34° 20,43' E	3094.3	Profil	Airgun abgeschaltet	
SO232/075-1	5/2/2014	21:43	31° 47,65' S	34° 18,98' E	3079.6	Profil	Ende Profil	
SO232/075-1	5/2/2014	21:43	31° 47,65' S	34° 18,98' E	3079.6	Profil	Stationsende	
SO232/076-1	5/2/2014	21:45	31° 47,70' S	34° 18,78' E	3078	Profil	Stationsbeginn	AWI-20140219
SO232/076-1	5/2/2014	21:45	31° 47,70' S	34° 18,78' E	3078	Profil	Beginn Profil	rwk: 217°, d: 137 nm
SO232/076-1	5/2/2014	21:57	31° 48,41' S	34° 18,03' E	3098	Profil	Airgun eingeschaltet	
SO232/076-1	5/3/2014	12:03	32° 43,52' S	33° 28,90' E	3413.2	Profil	Airgun abgeschaltet	
SO232/076-1	5/3/2014	12:50	32° 46,50' S	33° 26,26' E	3319.3	Profil	Airgun Soft Start	
SO232/076-1	5/3/2014	13:04	32° 47,39' S	33° 25,39' E	3357.4	Profil	Airgun eingeschaltet	
SO232/076-1	5/4/2014	0:50	33° 37,38' S	32° 40,36' E	3217.7	Profil	Airgun abgeschaltet	
SO232/076-1	5/4/2014	0:50	33° 37,38' S	32° 40,36' E	3217.7	Profil	Ende Profil	
SO232/076-1	5/4/2014	0:50	33° 37,38' S	32° 40,36' E	3217.7	Profil	Stationsende	

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/077-1	5/4/2014	1:41	33° 35,63' S	32° 39,72' E	3415.2	Profil	Stationsbeginn	AWI-20140220
SO232/077-1	5/4/2014	1:41	33° 35,63' S	32° 39,72' E	3415.2	Profil	Beginn Profil	rwk: 098°, d: 114 nm
SO232/077-1	5/4/2014	1:49	33° 35,72' S	32° 40,46' E	3370.8	Profil	Airgun Soft Start	
SO232/077-1	5/4/2014	2:04	33° 35,88' S	32° 41,86' E	3277.1	Profil	Airgun eingeschaltet	
SO232/077-1	5/5/2014	1:28	33° 52,13' S	34° 55,07' E	2037.9	Profil	Airgun abgeschaltet	
SO232/077-1	5/5/2014	1:28	33° 52,13' S	34° 55,07' E	2037.9	Profil	Ende Profil	
SO232/077-1	5/5/2014	1:28	33° 52,13' S	34° 55,07' E	2037.9	Profil	Stationsende	
SO232/078-1	5/5/2014	2:30	33° 49,60' S	34° 52,95' E	1909.9	Profil	Stationsbeginn	AWI-20140221
SO232/078-1	5/5/2014	2:30	33° 49,60' S	34° 52,95' E	1909.9	Profil	Beginn Profil	rwk: 187°, d: 47 nm
SO232/078-1	5/5/2014	2:39	33° 50,25' S	34° 52,88' E	1960.4	Profil	Airgun Soft Start	
SO232/078-1	5/5/2014	14:43	34° 36,01' S	34° 46,12' E	2707.5	Profil	Ende Profil	
SO232/078-1	5/5/2014	14:43	34° 36,01' S	34° 46,12' E	2707.5	Profil	Stationsende	
SO232/079-1	5/5/2014	16:04	34° 33,92' S	34° 48,48' E	2682.4	Profil	Stationsbeginn	AWI-20140222
SO232/079-1	5/5/2014	16:04	34° 33,92' S	34° 48,48' E	2682.4	Profil	Beginn Profil	rwk: 270°, d: 136 nm
SO232/079-1	5/5/2014	16:11	34° 34,00' S	34° 47,73' E	14.7	Profil	Airgun Soft Start	
SO232/079-1	5/6/2014	5:57	34° 34,60' S	33° 21,58' E	2278.7	Profil	Airgun abgeschaltet	
SO232/079-1	5/6/2014	6:05	34° 34,60' S	33° 20,84' E	2280.6	Profil	Airgun Soft Start	
SO232/079-1	5/6/2014	18:39	34° 35,09' S	32° 3,29' E	3361.3	Profil	Ende Profil	
SO232/079-1	5/6/2014	18:39	34° 35,09' S	32° 3,29' E	3361.3	Profil	Airgun abgeschaltet	
SO232/079-1	5/6/2014	18:54	34° 35,13' S	32° 2,25' E	3388.2	Profil	Bb-Airgunarray an Deck	
SO232/079-1	5/6/2014	19:08	34° 35,44' S	32° 1,39' E	3426.4	Profil	Bird a. D.	Nr. 01
SO232/079-1	5/6/2014	21:43	34° 39,06' S	31° 51,66' E	3667.2	Profil	Bird a. D.	Nr. 12
SO232/079-1	5/6/2014	21:46	34° 39,12' S	31° 51,47' E	3671.1	Profil	Streamer an Deck	
SO232/079-1	5/6/2014	21:47	34° 39,14' S	31° 51,41' E	3671.7	Profil	Streamerendboje a. D.	
SO232/079-1	5/6/2014	21:52	34° 39,24' S	31° 51,07' E	3680.8	Profil	Stationsende	
SO232/080-1	5/8/2014	3:46	36° 17,51' S	26° 2,80' E	4701.8	Vermessung	Beginn Station	
SO232/080-1	5/8/2014	3:46	36° 17,51' S	26° 2,80' E	4701.8	Vermessung	Beginn Profil	rwk: 229°, d: 67 nm
SO232/080-1	5/8/2014	10:26	37° 1,52' S	24° 59,62' E	3451.2	Vermessung	Kursänderung	rwk: 228°, d: 13 nm
SO232/080-1	5/8/2014	11:44	37° 9,93' S	24° 47,88' E	3852.1	Vermessung	Kursänderung	rwk: 233°, d: 17 nm
SO232/080-1	5/8/2014	13:23	37° 19,72' S	24° 31,28' E	4537.1	Vermessung	Kursänderung	rwk: 090°, d: 6 nm
SO232/080-1	5/8/2014	14:09	37° 20,05' S	24° 38,80' E	3866.7	Vermessung	Ende Profil	
SO232/080-1	5/8/2014	14:09	37° 20,05' S	24° 38,80' E	3866.7	Vermessung	Ende Station	
SO232/081-1	5/8/2014	14:10	37° 20,03' S	24° 38,85' E	3872.4	Profil	Stationsbeginn	AWI-201402231
SO232/081-1	5/8/2014	14:14	37° 20,04' S	24° 39,00' E	3873.3	Profil	Streamerendboje z.W.	
SO232/081-1	5/8/2014	14:18	37° 20,04' S	24° 39,13' E	3881.6	Profil	Bird z. W.	Nr. 01
SO232/081-1	5/8/2014	15:56	37° 20,49' S	24° 42,43' E	3907.3	Profil	Bird z. W.	Nr. 12

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/081-1	5/8/2014	16:06	37° 20,54' S	24° 42,84' E	3886	Profil	Streamer zu Wasser	
SO232/081-1	5/8/2014	17:00	37° 21,02' S	24° 46,97' E	3794	Profil	Kursänderung	rwk: 002°
SO232/081-1	5/8/2014	17:22	37° 19,54' S	24° 47,57' E	3775.5	Profil	Bb-Airgunarray zu Wasser	
SO232/081-1	5/8/2014	17:22	37° 19,54' S	24° 47,57' E	3775.5	Profil	Beginn Profil	rwk: 002°, d: 11 nm
SO232/081-1	5/8/2014	17:27	37° 19,14' S	24° 47,58' E	3769.7	Profil	Airgun Soft Start	
SO232/081-1	5/8/2014	19:01	37° 9,95' S	24° 47,88' E	3860.4	Profil	Ende Profil	
SO232/081-1	5/8/2014	19:01	37° 9,95' S	24° 47,88' E	3860.4	Profil	Stationsende	
SO232/082-1	5/8/2014	19:02	37° 9,86' S	24° 47,88' E	3888.5	Profil	Stationsbeginn	AWI-2014022311
SO232/082-1	5/8/2014	19:02	37° 9,86' S	24° 47,88' E	3888.5	Profil	Beginn Profil	rwk: 359°, d: 15 nm
SO232/082-1	5/8/2014	22:29	36° 55,30' S	24° 47,51' E	4589.4	Profil	Ende Profil	
SO232/082-1	5/8/2014	22:29	36° 55,30' S	24° 47,51' E	4589.4	Profil	Stationsende	
SO232/083-1	5/9/2014	0:05	36° 58,04' S	24° 49,78' E	4144	Profil	Stationsbeginn	AWI-201402232
SO232/083-1	5/9/2014	0:05	36° 58,04' S	24° 49,78' E	4144	Profil	Beginn Profil	rwk: 114°, d: 9 nm
SO232/083-1	5/9/2014	1:12	37° 1,44' S	24° 59,58' E	3460.8	Profil	Ende Profil	
SO232/083-1	5/9/2014	1:12	37° 1,44' S	24° 59,58' E	3460.8	Profil	Stationsende	
SO232/084-1	5/9/2014	1:13	37° 1,49' S	24° 59,72' E	3455.6	Profil	Stationsbeginn	AWI-2014022321
SO232/084-1	5/9/2014	1:13	37° 1,49' S	24° 59,72' E	3455.6	Profil	Beginn Profil	rwk: 129°, d: 12 nm
SO232/084-1	5/9/2014	3:10	37° 9,61' S	25° 12,22' E	3016.4	Profil	Ende Profil	
SO232/084-1	5/9/2014	3:11	37° 9,66' S	25° 12,30' E	2993.6	Profil	Airgun abgeschaltet	
SO232/084-1	5/9/2014	3:28	37° 10,45' S	25° 13,57' E	3444.7	Profil	Bb-Airgunarray an Deck	
SO232/084-1	5/9/2014	3:50	37° 11,29' S	25° 12,99' E	3392.9	Profil	Bird a. D.	Nr. 01
SO232/084-1	5/9/2014	6:38	37° 15,09' S	25° 6,07' E	3453.5	Profil	Bird a. D.	Nr. 12
SO232/084-1	5/9/2014	6:43	37° 15,21' S	25° 5,85' E	3429.2	Profil	Streamerendboje a. D.	
SO232/084-1	5/9/2014	6:59	37° 15,13' S	25° 5,66' E	3409.2	Profil	Stationsende	
SO232/085-1	5/9/2014	10:27	37° 2,81' S	25° 15,03' E	3580.8	Kettensack-dredge	Stationsbeginn	
SO232/085-1	5/9/2014	10:27	37° 2,81' S	25° 15,03' E	3580.8	Kettensack-dredge	z.W.	W 6
SO232/085-1	5/9/2014	11:38	37° 2,76' S	25° 14,79' E	3548.7	Kettensack-dredge	Boko	SL: 3615 m
SO232/085-1	5/9/2014	11:40	37° 2,76' S	25° 14,79' E	3533.6	Kettensack-dredge	Auslegen	rwk: 268°, d: 650 m
SO232/085-1	5/9/2014	12:03	37° 2,72' S	25° 14,22' E	3318.9	Kettensack-dredge	Beginn dredgen	SLmax: 3920 m
SO232/085-1	5/9/2014	12:43	37° 2,72' S	25° 14,19' E	3316	Kettensack-dredge	frei vom Grund	SL: 3181 m, SZmax: 52,7 kN
SO232/085-1	5/9/2014	13:47	37° 2,77' S	25° 14,44' E	3336	Kettensack-dredge	a.D.	
SO232/085-1	5/9/2014	13:56	37° 2,87' S	25° 14,71' E	3533.3	Kettensack-dredge	Stationsende	
SO232/086-1	5/9/2014	17:12	36° 58,89' S	24° 57,83' E	3980.7	Kettensack-dredge	Stationsbeginn	
SO232/086-1	5/9/2014	17:16	36° 58,88' S	24° 57,81' E	4021.6	Kettensack-dredge	z.W.	W 6
SO232/086-1	5/9/2014	18:36	36° 58,88' S	24° 57,74' E	3994.8	Kettensack-dredge	Boko	SL: 4010 m

A.4 Stationsliste / Station List

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equip-ment used	Action	Remarks
SO232/086-1	5/9/2014	18:37	36° 58,88' S	24° 57,73' E	3974.9	Kettensack- dredge	Auslegen	rwk: 232°, d: 809 m
SO232/086-1	5/9/2014	19:05	36° 59,16' S	24° 57,30' E	14.7	Kettensack- dredge	Beginn dredgen	SLmax: 4450 m
SO232/086-1	5/9/2014	19:46	36° 59,15' S	24° 57,26' E	3631.2	Kettensack- dredge	frei vom Grund	SL: 3610 m, SZmax: 65,2 kN
SO232/086-1	5/9/2014	21:03	36° 59,26' S	24° 57,41' E	3648.4	Kettensack- dredge	a.D.	
SO232/086-1	5/9/2014	21:18	36° 59,23' S	24° 57,30' E	3631.4	Kettensack- dredge	Stationsende	
SO232/087-1	5/9/2014	22:56	37° 4,17' S	24° 47,87' E	3474	Kettensack- dredge	Stationsbeginn	
SO232/087-1	5/9/2014	22:56	37° 4,17' S	24° 47,87' E	3474	Kettensack- dredge	z.W.	W 6
SO232/087-1	5/10/2014	0:06	37° 4,17' S	24° 47,72' E	3506	Kettensack- dredge	Boko	SL: 3488 m
SO232/087-1	5/10/2014	0:06	37° 4,17' S	24° 47,72' E	3506	Kettensack- dredge	Auslegen	rwk: 327°, d: 1000 m
SO232/087-1	5/10/2014	0:36	37° 3,64' S	24° 47,28' E	3147.5	Kettensack- dredge	Beginn dredgen	SLmax: 3900 m
SO232/087-1	5/10/2014	1:01	37° 3,60' S	24° 47,18' E	3048.7	Kettensack- dredge	KD hakt	SL: 3450 m, SZmax: 82 kn
SO232/087-1	5/10/2014	1:04	37° 3,62' S	24° 47,17' E	3168.5	Kettensack- dredge	KD hakt	SL: 3448 m, SZ: 80 kN
SO232/087-1	5/10/2014	1:23	37° 3,65' S	24° 47,20' E	14.7	Kettensack- dredge	frei vom Grund	SL: 3140 m
SO232/087-1	5/10/2014	2:26	37° 3,56' S	24° 47,14' E	3051.8	Kettensack- dredge	a.D.	
SO232/087-1	5/10/2014	2:48	37° 3,50' S	24° 47,07' E	3063.8	Kettensack- dredge	Stationsende	Ende Stationsarbeiten SO 232

A.5 REGISTRIERPARAMETER DER REFLEXIONSSEISMIK/ SEISMIC REFLECTION RECORDING PARAMETERS

Line		start		end	length [nm]	source	total volume [l]	shot interval [s]	No of shots	field tapes
	Date/ UTC	Lat/lat	Date/ UTC	Lat/lat						
AWI- 20140201	2.4.14/7:33	33.41895/ -34.53233	3.4.14/1:59	34.17836/ -35.94361	91	4 GI-guns	9.6	10	6721	P00037
AWI- 20140202	3.4.14/2:27	-35.9376/ 34.1585	4.4.14/10:33	-33.4726/ 34.2199	146	4 GI-guns	9.6	10	10843	P00037
AWI- 20140203	4.4.14/12:07	-35.5214/ 34.2208	5.4.14/19:33	-35.866/ 33.0807	153	4 GI-guns	9.6	10	11313	P00037/ P00038
AWI- 20140204	5.4.14/19:54	-35.8636/ 33.0623	6.4.14/15:51	-34.5102/ 33.3018	89	4 GI-guns	9.6	10	6608	P00038
AWI- 20140205	10.4.14/ 18:50	-34.706/ 32.061	11.4.14/00:142	-34.38/ 32.456	27	4 GI-guns	9.6	10	1946	P00397
AWI- 20140206	11.4.14/1:51	-34.379/ 32.457	11.4.14/20:29	-35.636/ 31.737	91	4 GI-guns	9.6	10	6706	P00397
AWI- 20140207	11.4.14/ 21:52	-35.636/ 31.735	12.4.14/16:54	-34.965/ 33.335	93	4 GI-guns	9.6	10	6849	P00397
AWI- 20140208	12.4.14/ 17:58	-34.982/ 33.298	13.4.14/13:51	-34.485/ 31.345	97	4 GI-guns	9.6	10	7165	P00397/ P00399
AWI- 20140209	13.4.14/ 15:10	-34.49499/ 31.38786	14.4.14/2:14	-34.58864/ 32.4864	54	4 GI-guns	9.6	10	3988	P00399
AWI- 20140210	14.4.14/3:18	-34.61063/ 32.47065	14.4.14/16:13	-33.84847/ 31.57718	63	4/3 GI-guns	9.6/7.2	10	4905	P00399
AWI- 20140211	14.4.14/ 17:14	-33.87365/ 31.58651	16.4.14/19:03	-34.004/ 36.26258	242	3 GI-guns	7.2	10	17936	P00396
AWI- 20140212	20.3.14/ 23:54	-32.476/ 36.447	22.4.14/ 1:48	-34.08/ 34.761	123	4 GI-guns	9.6	10	9325	P00396



AWI-20140213	22.4.14/3:19	-34.062/ 34.809	22.4.14/ 12:37	-33.568/ 34.036	45	4 GI-guns	9.6	10	3349	P00035/ P00036
AWI-20140214	22.4.14/ 12:37	-33.568/ 34.036	23.4.14/ 1:31		63	4 GI-guns	9.6	10	4645	P00036
AWI-20140215	23.4.12/2:13	-33.217/ 32.8527	23.4.12/ 17:35	-33.115/ 34.2566	75	4 GI-guns	9.6	10	5529	P00036
AWI-20140216	23.4.14/ 17:35	-33.115/ 34.2566	24.4.14/ 15:51	-33.4097/ 36.2201	108	4/3 GI-guns	9.6/7.2	10	8016	P00395
AWI-20140217	24.4.14/ 16:41	-33.42/ 36.2157	25.4.14/ 21:49	-32.2626/ 33.6245	141	3 GI-guns	7.2	10	10433	P00395
AWI-20140218	2.5.14/11:03	-31.7529/ 35.3944	2.5.14/ 21:30	-31.7931/ 34.3253	50	4 GI-guns	9.6	10	3686	P00395/ P00400
AWI-20140219	2.5.14/21:57	-31.8061/ 34.3012	4.5.14/ 00:50	-33.6317/ 32.6623	127	4 GI-guns	9.6	10	9415	P00400
AWI-20140220	4.5.14/ 1:48	-33.5936/ 32.6608	5.5.14/1:28	-33.8696/ 34.9234	115	4 GI-guns	9.6	10	8518	P00400
AWI-20140221	5.5.14/ 2:41	-33.8377/ 34.8814	5.5.14/ 14:43	-33.8696/ 34.9234	59	4 GI-guns	9.6	10	4334	P00194
AWI-20140222	5.5.14/16:11	-34.5665/ 34.7988	6.5.14/ 18:39	34.5848/ 32.0501	128	4 GI-guns	9.6	10	9473	P00194
AWI-20140231	8.5.14/17:27	-37.3199/ 24.7930	8.5.14/ 22:29	-36.9162/ 24.7929	25	4 GI-guns	9.6	10	1813	
AWI-20140232	8.5.14/23:50	-36.9519/ 24.7841	9.5.14/ 3:09	-37.1625/ 25.2079	17	4 GI-guns	9.6	10	1195	

A.6 ROCK SAMPLE DESCRIPTION

SO232 DR 6 Description of Location and Structure: Southern part of Mozambique Ridge, Region 1, shallowest area. Small circular cone in NW corner of plateau Dredge on bottom UTC 06/04/14 20:26hrs, lat 34°11.08'S, long 33°17.82'E, depth 1473m Dredge off bottom UTC 06/04/14 21:35hrs, lat 34°11.44'S, long 33°17.01'E, depth 1250m total volume: 1/3 full Comments: 2x large Mn-crust 1.5x0.7 m, several larger pieces of volcanoclastic material								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES
SO232-DR-6-1	1. Rock Type: volcanic 2. Size: 7x7x6.3 cm 3. Shape / Angularity: rounded 4. Color of cut surface: dark brown 5. Texture / Vesicularity: 30% vesicles, 20% filled 6. Phenocrysts: aphyric 7. Matrix: glassy 8. Secondary Minerals: filled vesicles 10. Comment: strongly altered; geochemistry questionable	x	x	6			x	Ref. Sample in Aliu-box 488
SO232-DR-6-2	1. Rock Type: volcanic, similar to DR06-1 but more altered 2. Size: 7.5x8x5 cm 3. Shape / Angularity: rounded 4. Color of cut surface: dark brown 5. Texture / Vesicularity: 50% vesicles, all filled 6. Phenocrysts: aphyric 7. Matrix: glassy, altered 8. Secondary Minerals: Cc? in vesicles 9. Encrustations: minor Mn coating 10. Comment: very strongly altered; geochemistry questionable	x	x	6				
SO232-DR-6-3	1. Rock Type: volcanic, similar to DR6-1 but more altered 2. Size: 10x8x5 cm 3. Shape / Angularity: rounded 4. Color of cut surface: dark brown 5. Texture / Vesicularity: mostly vesicles (>50%), all filled 6. Phenocrysts: aphyric 7. Matrix: glassy, altered 8. Secondary Minerals: vesicle filled with Cc 9. Encrustations: some Mn patches 10. Comment: very strongly altered, cracks dissecting rock	x	x	6				
SO232-DR-6-4	1. Rock Type: volcanic 2. Size: 11x7x6 cm 3. Shape / Angularity: rounded 4. Color of cut surface: orange-brown-white 5. Texture / Vesicularity: highly vesicular, all filled (>50%) 7. Matrix: glassy, strongly altered 8. Secondary Minerals: vesicles filled with white secondary minerals; probably Cc 9. Encrustations: minor Mn patched 10. Comment: strongly altered, big white Cc? patches	x	x	6				
SO232-DR-6-5	1. Rock Type: volcanoclastica 2. Size: 14x13x8 cm 3. Shape / Angularity: rounded 4. Color of cut surface: orange lapilli, white, dark xenoliths 5. Texture / Vesicularity: mm- to cm-large lapilli clasts 7. Matrix: glassy, altered 8. Secondary Minerals: some clasts within rock similar to DR06-01, white filled vesicles 10. Comment: lapilli very strongly altered	x	x	6				



A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-6-6	1. Rock Type: volcaniclastica 2. Size: 15x13x9 cm 3. Shape / Angularity: rounded 4. Color of cut surface: orange lapilli, white, dark xenoliths, similar to DR06-5) 5. Texture / Vesicularity: mm- to cm-large clasts 7. Matrix: glassy, altered 8. Secondary Minerals: some clasts within rock like sample DR06-1, white filled vesicles 10. Comment: lapilli very strongly altered	x	x	6					
SO232-DR-6-7 Mn	1. Rock Type: Mn-crust 2. Size: 22x17x12 cm					x			

SO232 DR 7

Description of Location and Structure: Southwest of previous location, E-W striking cliff; scarp or erosional, steepest section in the entire area, track runs oblique to dip

Dredge on bottom UTC 07/04/14 05:18hrs, lat 34°18.77'S, long 33°07.35'E, depth 2518m

Dredge off bottom UTC 07/04/14 06:24hrs, lat 34°18.58'S, long 33°07.86'E, depth 2077m

total volume: empty

Comments:

SO232 DR 8



Description of Location and Structure: Southern part of Mozambique Ridge, top region; same scarp as DR07; 1.5 nm further west







Dredge on bottom UTC 07/04/14 08:25hrs, lat 34°18.73'S, long 33°05.82'E, depth 2563m,

Dredge off bottom UTC 07/4/14 10:01hrs, lat 34°18.29'S, long 33°05.96'E, depth 2103m







total volume: few rocks

Comments: one bloc of volcanic breccia, corals coated with Mn

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-8-1A	1. Rock Type: volcanic 2. Size: 17x16x15 cm 3. Shape / Angularity: rounded 4. Color of cut surface: brown 5. Texture / Vesicularity: few vesicles ~5% 6. Phenocrysts: no phenocrysts; aphyric 7. Matrix: no texture, no minerals 8. Secondary Minerals: oxidized groundmass; Fe-Hydroxide? 9. Encrustations: 1cm Mn-encrustations 10. Comment: limited use for bulk geochemistry; maybe ok for immobile elements & Nd/Hf isotopes	x	x						
SO232-DR-8-1B	1. Rock Type: volcanic 2. Size: 17x16x15 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: few vesicles <5% 6. Phenocrysts: no phenocrysts, aphyric 7. Matrix: fairly dense, no minerals 8. Secondary Minerals: filled veins with white minerals, probably Cc 9. Encrustations: 1cm Mn-encrustations (?) 10. Comment: see DR08-1A, chips need careful handpicking under microscope	x	x						

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-8-1C	1. Rock Type: volcanic 2. Size: 12x8x10 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: larger vesicles (5%) 6. Phenocrysts: no phenocrysts 7. Matrix: no texture, no minerals 9. Encrustations: 1cm encrustations (Mn?) 10. Comment: this sample is the "matrix" of DR08-1A and DR08-1B, DR08-1A -> DR08-1C strongly altered	x	x						
SO232-DR-8-1D	1. Rock Type: volcanic 2. Size: 10x8x8 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: very few vesicles <5% 6. Phenocrysts: no phenocrysts 7. Matrix: dense, no minerals 8. Secondary Minerals: veins filled with secondary white minerals (Cc?) + brown minerals (Fe-Hydroxides?) 9. Encrustations: 1cm encrustations, similar to the veins material 10. Comment: limited use for geochemistry								
SO232-DR-8-1E	1. Rock Type: volcanic 2. Size: 13x8x13 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: vesicles filled with sedimentary (?) material 6. Phenocrysts: no phenocrysts 7. Matrix: no texture, no minerals 9. Encrustations: 1cm encrustations, similar to the veins material 10. Comment: probably not suitable for geochemistry								
SO232-DR-8-2	1. Rock Type: volcaniclastica 2. Size: 5x6x6 cm 3. Shape / Angularity: round 4. Color of cut surface: grey 5. Texture / Vesicularity: conglomerate of nodules ? 8. Secondary Minerals: vesicles are sometimes filled with yellow component 10. Comment: sedimentary or volcanic?	x							
SO232-DR-8-3	1. Rock Type: probably sediment 2. Size: 7x4x6 cm 3. Shape / Angularity: round 4. Color of cut surface: yellow/light brown 5. Texture / Vesicularity: conglomerate of yellow/brown components					x			
SO232-DR-8-4	1. Rock Type: volcanic 2. Size: 6x3x11 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: see DR08-1A 9. Encrustations: thick crust, similar to previous samples 10. Comment: too small to be processed								

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-8-1C	1. Rock Type: volcanic 2. Size: 12x8x10 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: larger vesicles (5%) 6. Phenocrysts: no phenocrysts 7. Matrix: no texture, no minerals 9. Encrustations: 1cm encrustations (Mn?) 10. Comment: this sample is the "matrix" of DR08-1A and DR08-1B, DR08-1A -> DR08-1C strongly altered	x	x						
SO232-DR-8-1D	1. Rock Type: volcanic 2. Size: 10x8x8 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: very few vesicles <5% 6. Phenocrysts: no phenocrysts 7. Matrix: dense, no minerals 8. Secondary Minerals: veins filled with secondary white minerals (Cc?) + brown minerals (Fe-Hydroxides?) 9. Encrustations: 1cm encrustations, similar to the veins material 10. Comment: limited use for geochemistry								
SO232-DR-8-1E	1. Rock Type: volcanic 2. Size: 13x8x13 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: vesicles filled with sedimentary (?) material 6. Phenocrysts: no phenocrysts 7. Matrix: no texture, no minerals 9. Encrustations: 1cm encrustations, similar to the veins material 10. Comment: probably not suitable for geochemistry								
SO232-DR-8-2	1. Rock Type: volcanoclastica 2. Size: 5x6x6 cm 3. Shape / Angularity: round 4. Color of cut surface: grey 5. Texture / Vesicularity: conglomerate of nodules ? 8. Secondary Minerals: vesicles are sometimes filled with yellow component 10. Comment: sedimentary or volcanic?	x							
SO232-DR-8-3	1. Rock Type: probably sediment 2. Size: 7x4x6 cm 3. Shape / Angularity: round 4. Color of cut surface: yellow/light brown 5. Texture / Vesicularity: conglomerate of yellow/brown components					x			
SO232-DR-8-4	1. Rock Type: volcanic 2. Size: 6x3x11 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: see DR08-1A 9. Encrustations: thick crust, similar to previous samples 10. Comment: too small to be processed								

SO232 DR 9
Description of Location and Structure: Southern part of Mozambique Ridge, top region, small cone south of top plateau

Dredge on bottom UTC 07/04/14 13:56hrs, lat 34°24.77'S, long 33°17.95'E, depth 2306m

Dredge off bottom UTC 07/04/14 15:13hrs, lat 34°24.26'S, long 33°18.03'E, depth 1990m

total volume: empty

Comments: Maximum wire length 2700m

SO232 DR 10
Description of Location and Structure: Southern part of Mozambique Ridge, "top plateau", southern slope of plateau-like structure on top of Southern Mozambique Ridge

Dredge on bottom UTC 07/04/14 18:22hrs, lat 34°20.72'S, long 33°19.22'E, depth 1942m

Dredge off bottom UTC 07/04/14 19:25hrs, lat 34°20.29'S, long 33°19.26'E, depth 1713m

total volume: empty except one small piece of coral

Comments:





SO232 DR 11
Description of Location and Structure: Southern part of Mozambique Ridge, "Top Plateau", southern slope of plateau like structure on top of Southern Mozambique Ridge. 3nm NW of DR10

Dredge on bottom UTC 07/04/14 21:15hrs, lat 34°19.21'S, long 33°16.14'E, depth 2056m





Dredge off bottom UTC 07/04/14 22:30hrs, lat 34°18.78'S, long 33°16.16'E, depth 1752m

total volume: few rocks

Comments: slope-breccia from top of seafloor with Mn-crust

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-11-1	1. Rock Type: breccia (Cc matrix-supported) with angular porphyric lava fragments 2. Size: 23x16x9 cm; fragments up to 7cm; the following describes the fragments! 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: dark brown, reddish 5. Texture / Vesicularity: porphyric, dense, no vesicles 6. Phenocrysts: Fsp: round to elongated, 25%, 1-5mm, appear fairly fresh; Px: reddish, more altered, 3%, <1-2mm 7. Matrix: dense, fine-grained 8. Secondary Minerals: matrix oxidized 10. Comment: suitable for dating, cut out largest angular clast and labelled DR11-1A. High abundance of Fsp phenocrysts indicates fairly evolved lava that underwent prolonged differentiation. Maybe consistent with late stage eruptions in top region (volcano) of MOZ Ridge.	x	x				x 1A	Ref. Sample in Alu-box 488	 
SO232-DR-11-2	1. Rock Type: porphyric pillow fragment with possible chilled margin, v-shaped cooling cracks 2. Size: 9x6x6 cm 3. Shape / Angularity: pillow-shaped 4. Color of cut surface: brown to reddish 5. Texture / Vesicularity: porphyric, dense 6. Phenocrysts: amount of phenocrysts decreases towards margin; Fsp: round, elongated, 15%, <3 mm, appear fairly fresh; Px: dark-black, round / angular; Ol?: red, round, altered, <1%, 1-3mm 7. Matrix: see DR11-1 8. Secondary Minerals: see DR11-1 9. Encrustations: Mn coating, 1mm-thick, carbonate crust on top of chilled margin 10. Comment: overall similar to DR11-1; good for dating. Pillow indicates submarine volcanism in top region of Mozambique Ridge	x							 

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-11-3	1. Rock Type: pillow fragment, more pronounced chilled margin (5mm-thick) than DR11-2 2. Size: 10x10x6 cm 3. Shape / Angularity: angular, kind of pillow shaped 4. Color of cut surface: dark brown / reddish chilled margin, grades into grey towards pillow centre 5. Texture / Vesicularity: porphyric (dense), 0.5% vesicles filled 6. Phenocrysts: amount of phenocrysts decreases towards margin; Fsp: round, elongated, 15%, <3 mm, appear fairly fresh; Px: dark/black, round / angular; Ol or Px?: red, round, altered, <1%, 1-3 mm 7. Matrix: see DR11-1; grey fresh matrix at the interior side of pillow fragment 8. Secondary Minerals: Cc fillings in vesicles 9. Encrustations: Mn coating 10. Comment: good for dating, probably best for geochemistry	x					x		
SO232-DR-11-4	1. Rock Type: breccia with <1cm-size clasts 2. Size: 11x9x12 cm 10. Comment: representative sample for the majority DR11 rocks								
SO232-DR-11-5	1. Rock Type: breccia with <1cm-size clasts 2. Size: 10x7x6 cm 10. Comment: similar to DR11-4								
SO232-DR-11-6	1. Rock Type: breccia with <1cm-size clasts 2. Size: 13x7x5 cm 10. Comment: similar to DR11-4								

SO232 DR 12






Description of Location and Structure: Southern Moz.-ridge, E of high plateau; very small ridge according to seismic reflection profile AWI-20140203, magmatic basement should crop out here, dredge track along south facing slope

Dredge on bottom UTC 08/04/14 02:29hrs, lat 34°18.13'S, long 33°50.69'E, depth 2397m






Dredge off bottom UTC 08/04/14 04:26hrs, lat 34°17.65'S, long 33°50.72'E, depth 2183m








total volume: empty

Comments: EM120 water depth varies a lot






SO232 DR 13 Description of Location and Structure: Southern part of Mozambique Ridge, eastern region, northern flank of a small E-W trending valley Dredge on bottom UTC 08/04/14 12:51hrs, lat 34°51.65'S, long 34°05.25'E, depth 3024m Dredge off bottom UTC 08/04/14 14:08hrs, lat 34°51.09'S, long 34°05.28'E, depth 2770m total volume: few rocks Comments: Sediment (± soft), crust									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-13-1	1. Rock Type: sediment 2. Size: 34x32x8 cm 3. Shape / Angularity: angular to rounded 4. Color of cut surface: light, yellow 5. Texture / Vesicularity: few vesicles 8. Secondary Minerals: yellow matrix with black dots and lines 9. Encrustations: few mm-size black encrustation					x			
SO232-DR-13-2	1. Rock Type: sediment 2. Size: 21x13x7 cm 10. Comment: very similar to DR13-1 but the bloc is more massive compared to DR13-1, crust texture is smoother					x			
SO232-DR-13-3	1. Rock Type: sediment mud 2. Size: 12x5x3 cm 10. Comment: color: green olive to light grey, slightly consolidated					x			
SO232-DR-13-4	1. Rock Type: Mn nodule 2. Size: 8x6x5 cm 3. Shape / Angularity: round 4. Color of cut surface: reddish core with thick Mn rim 9. Encrustations: core is 1x3 cm and Mn-crust is about 2cm-thick 10. Comment: very nice example for a Mn nodule								
SO232 DR 14 Description of Location and Structure: Southern part of Mozambique Ridge, SE facing slope of small nose like structure. According to seismic profile AWI-20140201 basement should crop out at lower part of slope, in seismics this basement looks like a later magmatic event that bends sedimentary strata Dredge on bottom UTC 08/04/14 19:31hrs, lat 35°07.27'S, long 33°42.94'E, depth 3500m Dredge off bottom UTC 08/04/14 20:39hrs, lat 35°06.87'S, long 33°42.80'E, depth 3153m total volume: 1/3 full Comments: pillow fragments 10cm - 40cm size									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-14-1	1. Rock Type: volcanic, pillow lava fragment, moderately fresh 2. Size: 13x10x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey to light brown 5. Texture / Vesicularity: fine-grained (microcrystalline), very few phenocrysts (<1%), 10% vesicles, partly filled 6. Phenocrysts: small microphenocrystic Fsp needles 7. Matrix: fine-grained interstitial 8. Secondary Minerals: cracks filled with Mn (<1% wide), vesicles filled with reddish material 9. Encrustations: thin Mn coating 10. Comment: groundmass could be suitable for bulk geochemistry but needs picking; groundmass / microphenocrysts Fsp maybe useful for dating	x	x	4			x	Ref. Sample in Alu-box 488	








A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-14-2	1. Rock Type: volcanic, pillow lava fragment, moderately fresh 2. Size: 11x10x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey to light brown 5. Texture / Vesicularity: fine-grained, 10% vesicles, partly filled with reddish material 6. Phenocrysts: similar to DR14-1 7. Matrix: fine-grained, interstitial, altered 8. Secondary Minerals: cracks about 1mm filled with Mn, vesicles partly filled with reddish material 9. Encrustations: thin Mn coating 10. Comment: groundmass could be suitable for bulk geochemistry but needs picking; groundmass / microphenocrysts Fsp maybe useful for dating	x	x	4					
SO232-DR-14-3	1. Rock Type: volcanic, pillow lava fragment, partly altered 2. Size: 18x17x13 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: fresher parts grey, more altered parts are reddish-brown 5. Texture / Vesicularity: 15-20% vesicles (1-2mm), partly filled with Mn or reddish material, cracks and larger holes (both up to 1cm) 7. Matrix: coarser grained than DR14-1 and DR14-2 8. Secondary Minerals: see DR14-1 9. Encrustations: thin Mn coating 10. Comment: more strongly altered than DR14-1 and DR14-2. Appears of limited use for geochemistry.	x	x	5					
SO232-DR-14-4	1. Rock Type: volcanic, pillow lava fragment, altered 2. Size: 16x10x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey/brown 5. Texture / Vesicularity: coarser grained somewhat similar to DR14-3, vesicles <1% mostly along cracks filled with Mn and red material 6. Phenocrysts: aphyric 7. Matrix: similar DR14-3 8. Secondary Minerals: similar to DR14-3 9. Encrustations: similar to DR14-3 10. Comment: cracks (<1mm) filled with Mn; sample taken as backup for possible Fsp microphenocryst separation.	x	x	5					
SO232-DR-14-5	1. Rock Type: volcanic, pillow lava fragment, altered 2. Size: 16x10x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey/brown 5. Texture / Vesicularity: similar to DR14-3 and DR14-4, 5% vesicles up to 7mm 6. Phenocrysts: similar to DR14-3 and DR14-4 7. Matrix: similar to DR14-3 and DR14-4 8. Secondary Minerals: similar to DR14-3 and DR14-4 9. Encrustations: similar to DR14-3 and DR14-4 10. Comment: sample is backup for possible Fsp microphenocryst separation.	x	x	5					
SO232-DR-14-6	1. Rock Type: volcanic, pillow lava fragment, altered 2. Size: 13x13x9 cm otherwise similar to DR14-5 3. Shape / Angularity: similar to DR14-5 4. Color of cut surface: similar to DR14-5 5. Texture / Vesicularity: similar to DR14-5, <1% vesicles 6. Phenocrysts: similar to DR14-5 7. Matrix: similar to DR14-5 8. Secondary Minerals: similar to DR14-5 9. Encrustations: similar to DR14-5 10. Comment: backup for possible Fsp microphenocryst separation.	x	x	5					




SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-14-7X	1. Rock Type: volcanic, pillow lava fragment, altered similar to DR14-4 2. Size: 13x16x8 cm 10. Comment: similar to DR14-4	x							
SO232-DR-14-8X	1. Rock Type: volcanic, pillow lava fragment, altered similar to DR14-4 2. Size: 16x11x9 cm 10. Comment: similar to DR14-4	x							
SO232-DR-14-9X	1. Rock Type: volcanic, pillow lava fragment, altered similar to DR14-4 2. Size: 16x14x5 cm 10. Comment: similar to DR14-4	x							
SO232-DR-14-G1	1. Rock Type: pillow fragment with chilled glassy margin 2. Size: 1cm-thick fresh glass 5. Texture / Vesicularity: cracks within glass 7. Matrix: groundmass dense and strongly oxidized 8. Secondary Minerals: palagonite along cracks 9. Encrustations: 1mm Mn cover 10. Comment: glass margin cut off, matrix slab has been also saved. Glass needs careful picking but appears fairly fresh. Ar/Ar ages on glass and groundmass microphenocrysts should be aimed for. Amount of fresh glass appears sufficient for full spectra of geochemical analysis: EMP, LA-ICPMS, radiogenic isotopes, noble gases and volatiles		x	1	gl		x	Ref. Sample in Alu-box 488	 
SO232-DR-14-G2	1. Rock Type: pillow fragment with glass 2. Size: 0.5 - 1cm-thick glass margin 3. Shape / Angularity: pillow shaped 5. Texture / Vesicularity: small cracks 8. Secondary Minerals: palagonite along cracks 9. Encrustations: 1mm Mn cover 10. Comment: glass margin cut off and groundmass slab saved as well. Glass needs careful picking. Amount of glass smaller than sample DR14-G1. More detailed analysis to be decided after EMP and LA-ICPMS and comparison with DR14-G1.		x	1	gl		x		 

A.6 Rock Sample Description

SO232 DR 15									
Description of Location and Structure: Southern margin of Mozambique Ridge, East Section, Eastern end of E-W striking cliffs, south facing slope, flat plateau at top without any volcanic structure									
Dredge on bottom	UTC 09/04/14 01:44hrs, lat 35°17.11'S, long 33°23.81'E, depth 4021m								
Dredge off bottom	UTC 09/04/14 03:10hrs, lat 35°16.62'S, long 33°23.79'E, depth 3494m								
total volume:	few rocks								
Comments:	pillow fragments, some <1cm Mn-crust								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-15-1	1. Rock Type: volcanic 2. Size: 9x10x5 cm 3. Shape / Angularity: round 4. Color of cut surface: dark grey in the fresh part 5. Texture / Vesicularity: 1-2% vesicles, some filled with secondary minerals 6. Phenocrysts: Plg phenocrysts, 10%, Ol ? 7. Matrix: matrix fresh in most part of the sample 8. Secondary Minerals: vesicle fillings 10. Comment: very suitable sample for geochemical analysis except maybe not Ar/Ar dating, 2 fresh Ol observed -> very fresh	x	x				x	Ref. Sample in Alu-box 488	
SO232-DR-15-2	1. Rock Type: volcanic 2. Size: 13x7x9 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: <1% vesicles, filled 6. Phenocrysts: 1% Plg 7. Matrix: matrix less fresh than DR15-1 8. Secondary Minerals: vesicles filled with light and brown material, some black material in corner -> probably same as DR15-9) 9. Encrustations: thin crust (mm) 10. Comment: suitable for geochemistry but careful with hand picking, Ar/Ar maybe possible but depends on thin sections inspection	x	x	4? 3?					
SO232-DR-15-3	1. Rock Type: volcanic 2. Size: 13x8x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, reddish 5. Texture / Vesicularity: <1% vesicles, not filled 6. Phenocrysts: 5% Plg, moderately fresh, mm-size 7. Matrix: few Plg needles in the matrix, relative fresh but with zonation 8. Secondary Minerals: same black material as in DR15-2 10. Comment: similar to DR15-2, appears suitable for dating	x	x	3					
SO232-DR-15-4	1. Rock Type: volcanic 2. Size: 10x6x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, reddish 6. Phenocrysts: 5% Plg, partly fresh, mm size 7. Matrix: see DR15-2 and DR 15-3 8. Secondary Minerals: see DR15-2 and DR 15-3 10. Comment: similar to DR15-2 and DR15-3, needs handpicking, few Plg can be used for dating	x	x	4					
SO232-DR-15-5	1. Rock Type: volcanic 2. Size: 8x6x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 6. Phenocrysts: 1% Plg 7. Matrix: Px and Plg in the Matrix 10. Comment: too small for geochemistry, if thin sections are promising try bulk geochemistry, seems suitable for age dating	x		3					

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-15-6	1. Rock Type: volcanic 2. Size: 8x9x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark 5. Texture / Vesicularity: 1% vesicles, partially filled 6. Phenocrysts: none or rock is too much altered 7. Matrix: groundmass fairly fresh with few Plg visible 8. Secondary Minerals: yellow vesicle filling 10. Comment: avoid vesicles during handpicking then suitable for bulk geochemistry on groundmass	x	x						
SO232-DR-15-7	1. Rock Type: volcanic 2. Size: 9x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: fine-grained 6. Phenocrysts: 1% Plg, not so fresh 7. Matrix: fine-grained, less fresh, some cracks 9. Encrustations: thick (1cm) Mn-crust on one side 10. Comment: limited use for geochemistry but maybe ok for dating	x		4					
SO232-DR-15-8	1. Rock Type: volcanic 2. Size: 9x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: a bit more dense, no vesicles 6. Phenocrysts: 1-2% Plg, fresh? 7. Matrix: Plg needles, reddish matrix 10. Comment: matrix is too altered for bulk geochemistry but age dating could be done	x	x	3					
SO232-DR-15-9X	1. Rock Type: volcanic 2. Size: 17x7x8 cm 3. Shape / Angularity: very angular 4. Color of cut surface: brown 5. Texture / Vesicularity: fine-grained with filled vesicles, some cracks 6. Phenocrysts: 5% Plg, some are fresh 7. Matrix: fine-grained altered matrix 8. Secondary Minerals: some secondary minerals in vesicles, cracks 10. Comment: for archive								
SO232-DR-15-10X	1. Rock Type: volcanic 2. Size: 6x9x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: 1% vesicles, filled 6. Phenocrysts: 5% Plg, moderately fresh 7. Matrix: altered matrix with Plg and Px needles, cracks 10. Comment: backup for minerals and archive								
SO232-DR-15-11X	1. Rock Type: volcanic 2. Size: 20x11x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark brown 5. Texture / Vesicularity: large vesicles, filled 6. Phenocrysts: few altered Plg 7. Matrix: altered matrix, cracks 10. Comment: for archive								
SO232-DR-15-12X	1. Rock Type: volcanic similar to DR15-10 and DR15-11 2. Size: 9x10x8 cm 10. Comment: for archive - presence of Ol								

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-15-13X	1. Rock Type: volcanic 2. Size: 8x10x6 cm 10. Comment: similar to DR-12X, cracks in matrix; backup for dating								
SO232-DR-15-14X	1. Rock Type: volcanic 2. Size: 9x10x5 cm 10. Comment: similar to DR15-10 through DR15-13; backup for dating								
SO232-DR-15-15X	1. Rock Type: sediment 2. Size: 8x7x5 cm 3. Shape / Angularity: round 4. Color of cut surface: yellow/light brown 5. Texture / Vesicularity: coarse-grained 10. Comment: solidified conglomerat?					x			

SO232 DR 16

Description of Location and Structure: Southern margin of Mozambique Ridge, East section; steep south facing cliff 1.5nm west of DR 15

Dredge on bottom UTC 09/04/14 06:15hrs, lat 35°17.06'S, long 33°22.13'E, depth 3894m

Dredge off bottom UTC 09/04/14 07:31hrs, lat 34°16.63'S, long 33°22.18'E, depth 3353m

total volume: empty

Comments: max. wire length 4250m

SO232 DR 17



Description of Location and Structure: Southern part of Mozambique Ridge, southern central margin, upper slope





Dredge on bottom UTC 09/04/14 10:42hrs, lat 35°17.36'S, long 33°16.05'E, depth 3453m

Dredge off bottom UTC 09/04/14 11:49hrs, lat 35°17.03'S, long 33°16.14'E, depth 3185m





total volume: two rocks







Comments:

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-17-1	1. Rock Type: volcanoclastica 2. Size: 17x12x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: thick black crust but brown/yellow clasts 5. Texture / Vesicularity: fine-grained clasts, lots of cracks 6. Phenocrysts: probably none 8. Secondary Minerals: sedimentation between the clasts 9. Encrustations: the clasts are coated with thick Mn-crust 10. Comment: use for magmatic geochemistry only if this location proves critical	x							
SO232-DR-17-2	1. Rock Type: Mn bloc 2. Size: 18x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: totally black 10. Comment: Mn								





SO232 DR 18										
Description of Location and Structure: Southern part of Mozambique Ridge, central southern margin, upper slope of upper morphological step which maybe the surface expression of a fault										
Dredge on bottom	UTC 09/04/14 15:34hrs, lat 35°11.62'S, long 33°04.09'E, depth 3037m									
Dredge off bottom	UTC 09/04/14 16:49hrs, lat 35°11.13'S, long 33°04.11'E, depth 2659m									
total volume:	1 huge block/crust + 2 rocks									
Comments:										
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE	
SO232-DR-18-1	1. Rock Type: fine-grained plutonic or dolerite, microgabbro fairly fresh 2. Size: 20x24x30 cm 3. Shape / Angularity: rounded 4. Color of cut surface: grey 5. Texture / Vesicularity: dense, medium-grained bigger, mm-cm size Fsp phenocrysts 6. Phenocrysts: Fsp, 7% 7. Matrix: microcrystalline, Fsp phenocrysts 9. Encrustations: covered in thick Mn-crust (dm-size) 10. Comment: rock was recovered as subrounded cobble from large Mn-crust. Appears to have undergone some transportation and erosion before deposition. Not necessarily a plutonic rock but could also be a dolerite or center of a massive, flood basalt type lava flow. Still it could also be dropstone, but sample DR18-2 with similar petrography is angular indicating less extensive transportation.	x	x					x	Ref. Sample in Alu-box 488 	
SO232-DR-18-2	1. Rock Type: plutonic rock, similar to DR18-1 2. Size: 12x10x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: dense, microcrystalline, some bigger, mm-cm size Fsp phenocrysts 6. Phenocrysts: Fsp, 7% 7. Matrix: microcrystalline, Fsp phenocrysts 9. Encrustations: recovered from large Mn-crust bloc 10. Comment: although similar in petrography, angularity argues against that this sample broke off from DR18-1	x								
SO232-DR-18-3	1. Rock Type: volcanic, altered 2. Size: 16x13x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown- reddish 5. Texture / Vesicularity: 10% vesicles, fine-grained, vesicles <1mm up to 3mm mostly filled 6. Phenocrysts: some Fsp phenocrysts 7. Matrix: fine-grained, mm-size Fsp needles 8. Secondary Minerals: white or greenish vesicles fillings 9. Encrustations: >1cm Mn-crust 10. Comment: smaller clast among others within Mn-crust	x								
SO232-DR-18-4	1. Rock Type: similar to DR18-3 2. Size: 9x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown- reddish 5. Texture / Vesicularity: some large vesicles, 15% vesicles are mostly 1 to 5mm) 6. Phenocrysts: some Fsp phenocrysts 7. Matrix: fine-grained, mm-size Fsp needles 8. Secondary Minerals: vesicle fillings of white and brown material 9. Encrustations: clast within 1-2cm Mn-crust 10. Comment: smaller clast among others within Mn-crust	x								
SO232-DR-18-5	1. Rock Type: Mn-crust 2. Size: 23x24x4 cm								no picture	

A.6 Rock Sample Description

SO232 DR 19									
Description of Location and Structure: Southern margin of Mozambique Ridge, Western part, second uppermost cliff, 12nm NW of DR18, steep south facing cliff									
Dredge on bottom		UTC 09/04/14 20:20hrs, lat 35°05.04'S, long 32°51.64'E, depth 3107m							
Dredge off bottom		UTC 09/04/14 21:51hrs, lat 35°04.52'S, long 32°51.63'E, depth 2573m							
total volume:		1/4 full							
Comments:		thick Mn-encrusted, very solid rocks. Freshly broken off from ground							
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-19-1	1. Rock Type: volcanic, very fresh, aphyric 2. Size: 5x5x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: medium grey 5. Texture / Vesicularity: aphyric, no vesicles 6. Phenocrysts: very few (<1%) Fsp phenocrysts (up to 2mm) 7. Matrix: dense 8. Secondary Minerals: not visible 9. Encrustations: thin Mn coating 10. Comment: very fresh, appears to be the freshest sample. Probably too small to deliver sufficient material for groundmass fsp. separation	x		x			x		
SO232-DR-19-2	1. Rock Type: volcanic, fresh, aphyric 2. Size: 9x6x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, slightly light brownish alteration 5. Texture / Vesicularity: aphyric, parts of the rock contain up to 20% vesicles up to 2mm and partly filled, other parts of sample are dense without vesicles 6. Phenocrysts: <1% phenocrysts, up to 2mm-long needles 7. Matrix: aphyric 8. Secondary Minerals: vesicle fillings 9. Encrustations: thin, partial Mn cover 10. Comment: very fresh, check for suitable groundmass Fsp.	x		x					
SO232-DR-19-3	1. Rock Type: volcanic, aphyric, slightly altered 2. Size: 36x23x17 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, brownish 5. Texture / Vesicularity: aphyric, >1% vesicles, mostly filled <0.5mm 6. Phenocrysts: <1% Plg phenocrysts, up to 2mm 7. Matrix: aphyric 8. Secondary Minerals: dark vesicle fillings 9. Encrustations: >1cm Mn coating (1-3cm) 10. Comment: alteration in some parts higher than in DR19-1 and DR19-2, abundant filled cracks. Check thin sections for groundmass phenocrysts for Ar-Ar dating. Even groundmass might be useful.	x	x	x			x GC=bag 3	Ref. Sample in Alu-box 488	
SO232-DR-19-4	1. Rock Type: volcanic, aphyric, slightly altered 2. Size: 15x6x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, brownish 5. Texture / Vesicularity: aphyric, >1% vesicles, mostly filled <0.5mm 6. Phenocrysts: <1% Plg phenocrysts, up to 2mm 7. Matrix: aphyric 8. Secondary Minerals: dark vesicle fillings 9. Encrustations: cm Mn-crust 10. Comment: some cracks with coating, to be avoided during picking	x							

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-19-5	1. Rock Type: volcanic, aphyric, fairly fresh 2. Size: 10x9x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, brownish 5. Texture / Vesicularity: aphyric, >1% vesicles, mostly filled <0.5mm 6. Phenocrysts: <1% Plg phenocrysts, up to 2mm 7. Matrix: aphyric 8. Secondary Minerals: dark vesicle fillings 9. Encrustations: 1cm Mn-crust 10. Comment: strong alteration (2cm) on one side, fresher on the other side (similar to DR19-3)	x		x					
SO232-DR-19-6	1. Rock Type: volcanic, moderately fresh 2. Size: 8x6x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, brownish 5. Texture / Vesicularity: aphyric, >1% vesicles, mostly filled <0.5mm 6. Phenocrysts: <1% Plg-phenocrysts, up to 2mm 7. Matrix: aphyric 8. Secondary Minerals: vesicle fillings 9. Encrustations: thin Mn coating 10. Comment: similar to DR19-3	x							
SO232-DR-19-7	1. Rock Type: volcanic, aphyric, moderately altered 2. Size: 16x12x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, brownish 5. Texture / Vesicularity: aphyric, >1% vesicles, mostly filled <0.5mm 6. Phenocrysts: <1% Plg phenocrysts, up to 2mm 7. Matrix: aphyric 8. Secondary Minerals: vesicle fillings dark 9. Encrustations: thin Mn coating, cracks 10. Comment: similar to DR19-5 but more intensely altered	x	x						
SO232-DR-19-8	1. Rock Type: volcanic, altered 2. Size: 12x13x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brownish, slightly grey 5. Texture / Vesicularity: 10% vesicles up to 3mm with white or black filling 6. Phenocrysts: Fsp phenocrysts (1mm) 7. Matrix: fine-grained 8. Secondary Minerals: Mn, vesicle filling 9. Encrustations: 1mm Mn coating 10. Comment: seems petrographically a second type of lava in this dredge, Plg phyr.	x							
SO232-DR-19-9-X	1. Rock Type: aphyric volcanic, moderately altered 2. Size: 15x7x8 cm 10. Comment: similar to DR19-7								
SO232-DR-19-10-X	1. Rock Type: aphyric volcanic, moderately altered 2. Size: 19x12x8 cm 10. Comment: similar to most abundant lava type in this dredge								

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-19-11-X	1. Rock Type: aphyric volcanic, moderately altered 2. Size: 15x6x4 cm 10. Comment: similar to most abundant lava type in this dredge								
SO232-DR-19-12-X	1. Rock Type: aphyric volcanic, moderately altered 2. Size: 10x7x6 cm 10. Comment: similar to most abundant lava type in this dredge but more altered								
SO232-DR-19-13-X	1. Rock Type: aphyric volcanic, strongly altered 2. Size: 18x6x6 cm 10. Comment: very strongly altered								
SO232-DR-19-14-X	1. Rock Type: aphyric volcanic, strongly altered 2. Size: 18x6x5 cm 10. Comment: very strongly altered								

SO232 DR 20

Description of Location and Structure: Southern Mozambique Ridge, Eastern section; corner where NW and ENE striking faults intersect, southeast facing slope on ENE striking fault scarp;

Dredge on bottom UTC 10/04/14 03:23hrs, lat 35°20.40'S, long 32°42.48'E, depth 4215m

Dredge off bottom UTC 10/04/14 04:53hrs, lat 35°20.22'S, long 32°42.76'E, depth 3723m

total volume: empty

Comments:

SO232 DR 21



Description of Location and Structure: Southern part of Mozambique Ridge, seamount at SW-corner of southern part






Dredge on bottom UTC 10/04/14 13:56hrs, lat 34°48.50'S, long 31°56.63'E, depth 3790m

Dredge off bottom UTC 10/04/14 15:00hrs, lat 34°48.07'S, long 31°56.70'E, depth 3427m






total volume: 2 rocks






Comments: lava fragment

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-21-1	1. Rock Type: volcanic 2. Size: 15x8x12 cm 3. Shape / Angularity: angular 4. Color of cut surface: light grey when dry 5. Texture / Vesicularity: very fine-grained, no vesicles, few cracks 6. Phenocrysts: 5-10% reddish, altered Plg (?) 7. Matrix: in the matrix, abundant Plg needles, most of them appear altered, remainder of the matrix is black (Px) 10. Comment: suitable for mineral separation and geochemistry	x	x				x	Ref. Sample in Alu-box 488	
SO232-DR-21-2	1. Rock Type: volcanic 2. Size: 7x7x15 cm 3. Shape / Angularity: angular 4. Color of cut surface: yellowish 5. Texture / Vesicularity: very fine-grained, no vesicles. 6. Phenocrysts: <1% very altered Plg 7. Matrix: very altered matrix 10. Comment: limited use for magmatic geochemistry	x							



SO232 DR 29									
Description of Location and Structure: Eastern margin of Mozambique Ridge at southern end, upper part of steep east facing scarp.									
Dredge track oblique to slope dip due to SW wind direction									
Dredge on bottom	UTC 17/04/14 03:37hrs, lat 34°04.52'S, long 36°13.62'E, depth 3825m								
Dredge off bottom	UTC 17/04/14 05:07hrs, lat 34°04.84'S, long 36°13.38'E, depth 3406m								
total volume:	1/8 full								
Comments:									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	At/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-29-1	1. Rock Type: volcanic 2. Size: 13x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: <1% vesicles 6. Phenocrysts: 1-2% mostly fresh mm-size Plg, probably altered Ol 7. Matrix: fine-grained matrix with Plg needles, magma-mingling possible (1cm blob) 10. Comment: very suitable for geochemistry and age dating, magma mingling maybe possible due to 2 phases of volcanism, belongs to lithology A	x	x	2-3			x	Ref. Sample in Alu-box 488	
SO232-DR-29-2	1. Rock Type: volcanic 2. Size: 9x7x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: 5-10% filled vesicles 6. Phenocrysts: 1% phenocrysts more altered than sample DR21-1 7. Matrix: similar to sample DR21-1 8. Secondary Minerals: some secondary minerals in vesicles 10. Comment: careful with handpicking, belongs to lithology A	x	x						
SO232 DR 29-3	1. Rock Type: volcanic 2. Size: 9x7x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: light grey 5. Texture / Vesicularity: no vesicles, some cracks 7. Matrix: very fine-grained, aphyric 8. Secondary Minerals: light green mineralization along cracks 10. Comment: suitable for geochemistry, carefull with handpicking but overall very fresh, belongs to lithology B	x	x				x		Ref. Sample in Alu-box 488
SO232 DR 29-4	1. Rock Type: volcanic, overall very similar to sample DR29-3 2. Size: 13x6x5 cm 3. Shape / Angularity: angular 10. Comment: matrix slightly more altered with reddish microcrysts compared to sample DR29-3, belongs to lithology B	x	x						
SO232-DR-29-5	1. Rock Type: volcanic, similar to sample DR29-3 2. Size: 7x7x5 cm 3. Shape / Angularity: angular 10. Comment: belongs to lithology B	x	x						
SO232-DR-29-6	1. Rock Type: volcanic, similar to sample DR29-3 2. Size: 11x9x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: light grey 5. Texture / Vesicularity: 1-2% vesicles without filling 10. Comment: careful with handpicking, some of vesicles might be filled, belongs to lithology B	x	x						



A.6 Rock Sample Description







SO232 DR 30									
Description of Location and Structure: Eastern margin of Mozambique Ridge, southern end, central part of steep scarp, dredge track is oblique to slope dip due to wind and current conditions									
Dredge on bottom	UTC 17/04/14 8:22hrs, lat 34°02.85'S, long 36°14.23'E, depth 4179m								
Dredge off bottom	UTC 17/04/14 9:20hrs, lat 34°03.08'S, long 36°13.94'E, depth 3847m								
total volume:	few rocks								
Comments:									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-30-1	1. Rock Type: volcanic 2. Size: 17x15x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark, brown/reddish 5. Texture / Vesicularity: few large vesicles (mm-->cm), partially filled 6. Phenocrysts: 2-5% fresh Plg, mm- size 7. Matrix: microcrystalline, needles, relatively fresh 8. Secondary Minerals: some mud in the vesicles and greenish minerals 10. Comment: fresh sample with fresh Plg, suitable for geochemistry (careful with handpicking!) and age dating.	x	x	2-3			x		
SO232-DR-30-2	1. Rock Type: volcanic 2. Size: 19x11x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: greyish to light brown 5. Texture / Vesicularity: <1% vesicles, aphyric 7. Matrix: relatively aphyric, fine-grained but few clusters with Plg and Px (<mm) 10. Comment: good matrix, suitable for geochemistry --> but could be also sediment	x	x						
SO232-DR-30-3	1. Rock Type: volcanic 2. Size: 12x8x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark brown 5. Texture / Vesicularity: 5% vesicles, partially filled 6. Phenocrysts: 5% phenocrysts, Plg (mm-size) still fresh. Maybe Ol 7. Matrix: fine-grained, relatively fresh 10. Comment: careful with hand picking. overall good sample also for age dating	x	x	3			x (?)		
SO232-DR-30-4	1. Rock Type: volcanic 2. Size: 18x14x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: greyish 5. Texture / Vesicularity: 10% open vesicles, just a few are filled 7. Matrix: fine-grained, microcrystalline 10. Comment: looks still fresh but be careful during handpicking	x	x						
SO232-DR-30-5	1. Rock Type: volcanic 2. Size: 11x9x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: 1-5% vesicles, mm-size, partially filled 7. Matrix: microcrystalline, Plg and Px; seems fresh 10. Comment: taken as backup	x						Ref. Sample in Alu-box 488	

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-30-6	1. Rock Type: volcanic 2. Size: 10x10x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: light brown 5. Texture / Vesicularity: 1% vesicles, partially filled and cracks 6. Phenocrysts: <1% Plg, ~ fresh visible 7. Matrix: fine-grained, with some Plg needles 10. Comment: backup for age dating and mineral separation	x							
SO232-DR-30-7	1. Rock Type: volcanic 2. Size: 9x6x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark 5. Texture / Vesicularity: 5-10% vesicles, partially filled 6. Phenocrysts: nice and fresh Plg, 10%, mm- size 7. Matrix: like sample DR30-4 8. Secondary Minerals: some in the vesicles 10. Comment: backup for geochemistry and mineral separation; could be useful	x	x	x					
SO232-DR-30-8	1. Rock Type: volcanic 2. Size: 24x12x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: 5% vesicles, size >mm 7. Matrix: fine-grained, altered 8. Secondary Minerals: some greenish material in the vesicles 10. Comment: altered; very limited use for geochemical analysis								
SO232-DR-30-9	1. Rock Type: volcanic, similar to DR30-4 or DR30-7 2. Size: 8x7x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: similar to DR30-4 or DR30-7 7. Matrix: Plg microcrysts 10. Comment: backup for mineral separation and age dating								
SO232-DR-30-10	1. Rock Type: volcanic, similar to DR30-4 2. Size: 10x6x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: similar to DR30-4 but vesicles are filled with mud and/or sediment 10. Comment: backup								

A.6 Rock Sample Description



SO232 DR 31										
Description of Location and Structure: Eastern margin of Mozambique Ridge, S-part; lowest step beneath steep scarp										
Dredge on bottom		UTC 17/04/14 14:46hrs, lat 33°57.83'S, long 36°17.45'E, depth 4749m								
Dredge off bottom		UTC 17/04/14 15:57hrs, lat 33°58.15'S, long 36°17.18'E, depth 4450m								
total volume:		2 rocks								
Comments:		max. wire length 5050m								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE	
SO232-DR-31-1	1. Rock Type: volcanic 2. Size: 10x7x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, greenish vesicle fillings 5. Texture / Vesicularity: 30% vesicles, 1-2cm in size, mostly filled 6. Phenocrysts: ca. 40% Plg, up to 4mm in size; dark round shaped Minerals (Px?), <1mm in size 7. Matrix: fine-grained with a lot of Plg phenocrysts 8. Secondary Minerals: vesicles filled with green secondary material 9. Encrustations: thin Mn coating 10. Comment: suitable for mineral separation and age dating	x	x							
SO232-DR-31-2	1. Rock Type: volcanic 2. Size: 17x10x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, slightly brownish 5. Texture / Vesicularity: dense, no vesicles 6. Phenocrysts: ca. 15% Plg, 1-3mm in size; about 25% small dark Minerals (Px?), some micro-Plg (?) 7. Matrix: dense matrix with phenocrysts, some cracks 8. Secondary Minerals: patches of greenish secondary formation of matrix 9. Encrustations: one patch of 1mm Mn coating	x	x				x	Ref. Sample in Alu-box 488		

SO232 DR 32										
Description of Location and Structure: Eastern margin of Moz. Ridge, ca. 15nm north of southern end; steep east facing scarp with break in slope in the middle, dredge track along lower part and oblique to slope										
Dredge on bottom		UTC 17/04/14 20:41hrs, lat 33°49.22'S, long 36°17.58'E, depth 4201m								
Dredge off bottom		UTC 17/04/14 22:02hrs, lat 33°49.46'S, long 36°17.16'E, depth 3739m								
total volume:		1/5 full								
Comments:		Mn-encrusted sediment, 1x large angular bloc of solidified sediment, possibly a few magmatic angular clasts								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE	
SO232-DR-32-1	1. Rock Type: volcanic or sedimentary; probably breccia 2. Size: 12x11x2 cm 3. Shape / Angularity: rounded 4. Color of cut surface: brown 5. Texture / Vesicularity: 15% vesicles or pores 7. Matrix: fine-grained matrix 9. Encrustations: 1cm thick Mn-crust	x								
SO232-DR-32-2	1. Rock Type: volcanic or sedimentary 2. Size: 20x10x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: green on top, then yellow, brown, yellow 5. Texture / Vesicularity: 30% vesicles or pores 7. Matrix: fine-grained 9. Encrustations: thin Mn coating	x								

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-32-3	1. Rock Type: volcanic or sedimentary 2. Size: 7x5x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: greenish - grey 5. Texture / Vesicularity: cracks, some pores or larger holes (up to 5mm) 7. Matrix: fine-grained 9. Encrustations: 1-3mm Mn-crust	x							
SO232-DR-32-4	1. Rock Type: sediment 2. Size: 17x12x6 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: green with reddish streaks 5. Texture / Vesicularity: 15% unfilled pores 7. Matrix: very fine-grained 9. Encrustations: 4mm Mn-crust	x				x			
SO232-DR-32-5	1. Rock Type: sediment 2. Size: 53x27x15 cm 3. Shape / Angularity: angular 4. Color of cut surface: green brown 7. Matrix: very fine-grained 9. Encrustations: Mn coating	x				x			
SO232-DR-32-6	1. Rock Type: breccia 2. Size: 20x7x10 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown, grey clasts in whitish-yellow matrix 9. Encrustations: Mn-crust up to 5mm-thick								
SO232-DR-32-7	1. Rock Type: sediment 2. Size: 11x6x4 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: dark green 5. Texture / Vesicularity: very low density, 10% vesicles, some filled with Mn 7. Matrix: fine-grained with mm-size clasts, Mn 9. Encrustations: Mn coating	x				x			
SO232-DR-32-8-Mn	1. Rock Type: sediment like sample DR32-4 in Mn-crust 2. Size: 24x19x12 cm 9. Encrustations: up to 5cm-thick Mn-crust					x			

A.6 Rock Sample Description

SO232 DR 33
Description of Location and Structure: Eastern margin of Mozambique Ridge; 0.5 nm up slope of DR 32, although DR 32 brought mostly sediment we intend to test if at the entire slope is a lot of sediment
Dredge on bottom UTC 18/04/14 01:06hrs, lat 33°49.08'S, long 36°16.54'E, depth 3523m
Dredge off bottom UTC 18/04/14 02:31hrs, lat 33°49.38'S, long 36°16.12'E, depth 2944m
total volume: 2 rocks
Comments: 1x Mn-encrusted solidified sediment, 1x vesicular strongly altered volcanic rock

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-33-1	1. Rock Type: volcanic, strongly altered 2. Size: 20x15x13 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: dark brown to grey 5. Texture / Vesicularity: up to 25% vesicles, mostly filled, especially at the outer part of the rock 6. Phenocrysts: no phenocrysts 7. Matrix: fine grained, Fsp visible but <1mm in length 8. Secondary Minerals: red clayey vesicle fillings, some fillings are more yellowish 9. Encrustations: up to 1cm Mn-crust 10. Comment: limited use for geochemical analysis	x	x						
SO232-DR-33-2	1. Rock Type: sediment 2. Size: 42x28x17 cm 3. Shape / Angularity: sediment clasts angular within Mn-crust 4. Color of cut surface: green with reddish streaks similar to DR32-4 5. Texture / Vesicularity: vesicles / pores <1% unfilled 7. Matrix: fine grained, clayey 9. Encrustations: Mn-crust >8cm 10. Comment: picture of whole rock marked with letter A					x			


SO232-DR-34
Description of Location and Structure: Eastern margin of Mozambique Ridge, steep east facing cliff, lower most part across cliff slightly oblique to slope



Dredge on bottom UTC 18/04/14 07:14hrs, lat 33°37.39'S, long 36°21.18'E, depth 4323m

Dredge off bottom UTC 18/04/14 08:27hrs, lat 33°37.62'S, long 36°20.78'E, depth 3943m

total volume: 3 rocks

Comments:

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-34-1	1. Rock Type: volcanic 2. Size: 17x10x12 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: <1% unfilled vesicles and a few small cracks 6. Phenocrysts: 5% fresh Plg accumulated at one corner of the rock, mm-size 7. Matrix: fine-grained, nearly aphyric matrix, relatively fresh, reddish material along the cracks, sometimes greenish (Px?) 10. Comment: relatively fresh sample for whole rock geochemistry and age dating, needs some care with handpicking. Note that green material could be secondary vesicle fillings	x	x	2-3				Ref. Sample in Alu-box 488	

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-34-2	1. Rock Type: volcanoclastica / breccia 2. Size: 13x6x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: yellow 5. Texture / Vesicularity: looks like a conglomerate of greyish material, maybe basalts/volcanics and yellow sedimentation 6. Phenocrysts: if grey parts are volcanic, then there is Plg (+ Qz) 8. Secondary Minerals: definitely some secondary mineralization 9. Encrustations: thin Mn coating 10. Comment: too altered; very limited use for geochemical analysis	x							
SO232-DR-34-3	1. Rock Type: volcano-sedimentary / breccia, similar to sample DR34-2 2. Size: 12x7x6 cm 5. Texture / Vesicularity: looks like a conglomerate of greyish material, maybe basalts/volcanics and yellow sedimentation	x							

SO232 DR-35





Description of Location and Structure: Eastern margin of Mozambique Ridge, steep east facing cliff. Upper most part of slope at small cliff

Dredge on bottom UTC 18/04/14 10:42hrs, lat 33°35.07'S, long 36°19.56'E, depth 3186m


Dredge off bottom UTC 18/04/14 13:01hrs, lat 33°35.76'S, long 36°19.5'E, depth 3171m

total volume: 3 rocks

Comments: Mn-crusts with small sediment and lava (?) clasts

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-35-01A	1. Rock Type: volcanoclastica in thick Mn-crust 2. Size: original: 18x12x8 cm, clast: 2-3 cm-large 3. Shape / Angularity: angular clast 4. Color of cut surface: brown 5. Texture / Vesicularity: fine-grained 6. Phenocrysts: altered mm-size Plg 7. Matrix: altered 8. Secondary Minerals: together with the volcanic clasts are some sedimentary pieces 9. Encrustations: >5cm Mn-crust 10. Comment: 2 thin sections labelled as 1A, one only from the clast, the other one probably from sediment	x							
SO232-DR-35-01B	1. Rock Type: Mn-crust 2. Size: 18x12x8 cm 8. Secondary Minerals: most of sediment pieces are here 9. Encrustations: >5cm-thick 10. Comment: defined as Mn-sample								
SO232-DR-35-02A	1. Rock Type: sedimentary pieces in thick Mn-crust 2. Size: original 19x8x6 cm 3. Shape / Angularity: rounded and smooth 4. Color of cut surface: red (bordeaux) 5. Texture / Vesicularity: possibly sediments?					x			
SO232-DR-35-02B	1. Rock Type: Mn-crust 2. Size: original 19x8x6 cm 9. Encrustations: >5cm crust 10. Comment: defined as Mn sample								

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-35-Mn	1. Rock Type: Mn-crust 2. Size: 10x4x6 cm								

SO232 DR-36





Description of Location and Structure: Eastern margin of Mozambique Ridge, lower part of the scarp, ca 22 nm north of DR-35








Dredge on bottom UTC 18/04/14 18:57hrs, lat 33°13.20'S, long 36°26.71'E, depth 4384m

Dredge off bottom UTC 18/04/14 20:12hrs, lat 33°13.48'S, long 36°26.39'E, depth 4003m







total volume: a few rocks (1 blue box)







Comments: crust and lava fragments

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-36-1	1. Rock Type: volcanic, fresh 2. Size: 8x7x2 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, 15% mostly filled vesicles up to 6mm in size 6. Phenocrysts: 15% Fsp up to 4mm in size 7. Matrix: fine-grained 8. Secondary Minerals: vesicles with Mn at rim and white Cc filling 9. Encrustations: thin Mn coating 10. Comment: appears suitable for dating	x	x	2-3				Ref. Sample in Alu-box 488	
SO232-DR-36-2	1. Rock Type: volcanic, moderately altered 2. Size: 19x10x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey-brown 5. Texture / Vesicularity: porphyric, dense 6. Phenocrysts: 1% Fsp up to 4mm large 7. Matrix: fine-grained 8. Secondary Minerals: Mn and Cc in cracks through the entire rock 9. Encrustations: thin Mn coating	x	x	3-4				Ref. Sample in Alu-box 488	
SO232-DR-36-3	1. Rock Type: volcanic 2. Size: 9x6x3 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: brownish-grey 5. Texture / Vesicularity: porphyric, dense 6. Phenocrysts: Opx? (light grey) up to 4mm in size (15%), Fsp up to 3mm in size (10%) 7. Matrix: fine-grained 8. Secondary Minerals: Mn coating	x		4					
SO232-DR-36-4	1. Rock Type: volcanic, altered 2. Size: 9x5x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: red-greyish 5. Texture / Vesicularity: slightly porphyric, at one corner of the rock 2mm big unfilled vesicles (3%), in rock center vesicles filled with Cc (1%) 6. Phenocrysts: 10% Fsp needles which become larger (up to 2mm) where vesicles are not filled, possibly Px 7. Matrix: fine-grained 8. Secondary Minerals: Cc in vesicles located in centre 9. Encrustations: Mn coating	x	x						

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-36-5	1. Rock Type: volcanic, altered 2. Size: 8x10x4 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: grey-brown 5. Texture / Vesicularity: porphyric, lots of cracks filled with Cc or Mn, dense 6. Phenocrysts: 2% Fsp up to 1mm in size 7. Matrix: fine-grained, dense 8. Secondary Minerals: Cc and Mn in cracks, green mineral at edge of piece	x	x						
SO232-DR-36-6	1. Rock Type: volcanic, altered, similar to sample DR36-5 2. Size: 9x6x6 cm 3. Shape / Angularity: angular 9. Encrustations: thin Mn-crust <1cm 10. Comment: more altered and more cracks than sample DR36-5	x							
SO232-DR-36-7	1. Rock Type: volcanic, altered 2. Size: 10x10x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown-yellow 5. Texture / Vesicularity: microcrystalline, dense 6. Phenocrysts: Fsp needles up to 3mm large or part of matrix? Px 1mm in size 7. Matrix: see above 9. Encrustations: thin Mn coating	x							
SO232-DR-36-8	1. Rock Type: volcanic, altered, similar to sample DR36-7 2. Size: 9x11x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: greyish-yellow-brown 5. Texture / Vesicularity: <1% 2mm-size vesicles, partly filled 6. Phenocrysts: up to 2mm-size Fsp (2%) and Px (5%) 7. Matrix: fine-grained but more porphyric than sample DR36-7 8. Secondary Minerals: Cc in some vesicles	x							
SO232-DR-36-9X	1. Rock Type: volcanic, more altered but similar to samples DR36-7 and DR36-8 2. Size: 21x17x4 cm								
SO232-DR-36-10X	1. Rock Type: volcanic, similar to samples DR36-7 and DR36-8 2. Size: 8x7x2 cm								
SO232-DR-36-11X	1. Rock Type: volcanic, similar to sample DR36-3 2. Size: 11x10x2 cm 9. Encrustations: Mn-crust >1cm 10. Comment: cracks, larger phenocrysts and vesicles than sample DR36-3								

A.6 Rock Sample Description

SO232-DR-37 Description of Location and Structure: Eastern margin of Mozambique Ridge, 3 nm of DR36 middle section of east facing cliff, track slightly oblique to dip Dredge on bottom UTC 18/04/14 23:34hrs, lat 33°1.05'S, long 36°26.63'E, depth 3768m Dredge off bottom UTC 19/04/14 00:49hrs, lat 33°11.49'S, long 36°26.24'E, depth 3481m total volume: 1/5 full Comments: 3x large Mn-encrusted sediment blocs (light brown) numerous angular clasts probably lava fragments									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-37-1	1. Rock Type: lava fragment, moderately fresh 2. Size: 8x6x4 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: grey - light brown 5. Texture / Vesicularity: slightly porphyric, up to 5mm large filled vesicles (15%) 6. Phenocrysts: <1% Fsp needles up to 3mm in size 7. Matrix: fine-grained 8. Secondary Minerals: blue-white vesicle fillings, Mn fillings and orange/brown clay fillings 9. Encrustations: thin Mn coating 10. Comment: fresh compared to rest of dredge, most rocks of this dredge are very similar	x							
SO232-DR-37-2	1. Rock Type: lava fragment, fairly fresh, similar to sample DR37-1 2. Size: 8x6x3 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: grey - light brown 6. Phenocrysts: <2mm if present 10. Comment: same as sample DR37-1 but more cracks and slightly smaller	x							
SO232-DR-37-3A	1. Rock Type: clast from breccia, clast: volcanic, altered similar to sample DR37-1 2. Size: breccia: 36x30x16 cm, clast: 10x7x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: light brown 5. Texture / Vesicularity: slightly porphyric, 5% filled vesicles up to 3mm large 6. Phenocrysts: <1mm Fsp needles, micro-Plg ? (<1%), <1mm Px ? (2%) 7. Matrix: fine-grained 8. Secondary Minerals: similar to sample DR37-1, cracks filled with Mn 9. Encrustations: thick Mn-crust around all clasts 10. Comment: best part of sample DR37-3	x	x						
SO232-DR-37-3B	1. Rock Type: similar to sample DR37-3A 2. Size: 13x7x7 cm 5. Texture / Vesicularity: 10% vesicles all filled up to 7mm large								
SO232-DR-37-3C	1. Rock Type: similar to sample DR37-3A 2. Size: 13x9x5 cm 5. Texture / Vesicularity: 7% filled vesicles, up to 1cm in size 9. Encrustations: Mn-crust up to 3cm still left for breccia at this sample								
SO232-DR-37-4	1. Rock Type: same as sample DR37-3 2. Size: 11x7x6 cm 5. Texture / Vesicularity: 5% filled vesicles up to 4mm in size 9. Encrustations: thin Mn coating	x	x						

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-37-5	1. Rock Type: same as sample DR37-3 2. Size: 11x9x6 cm 4. Color of cut surface: slightly darker than sample DR37-3 5. Texture / Vesicularity: 5% filled vesicles up to 1cm in size 9. Encrustations: 1cm-thick Mn-crust on one side of the rock	x	x						
SO232-DR-37-6	1. Rock Type: same as sample DR37-3 2. Size: 12x8x5 cm 5. Texture / Vesicularity: up to 5mm-large filled vesicles (10%) 9. Encrustations: thin Mn coating 10. Comment: few cracks filled with Mn	x							
SO232-DR-37-7	1. Rock Type: fresh, volcanic 2. Size: 10x7x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, slightly brownish 5. Texture / Vesicularity: slightly porphyric, 25% mainly filled vesicles up to 1mm in size 6. Phenocrysts: micro-Plg mostly <1mm (7%) 7. Matrix: fine-grained 8. Secondary Minerals: greenish vesicle fillings 9. Encrustations: totally encoated by 5mm Mn-crust 10. Comment: freshest sample of this dredge (due to total encrustation?), but different from the main lithology	x	x					Ref. Sample in Alu-box 488	
SO232-DR-37-8A	1. Rock Type: volcanic clast of breccia (same as samples DR37-8B and DR37-8C), altered 2. Size: breccia: 40x32x20 cm, clast: 7x6x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark brwn 5. Texture / Vesicularity: 30% vesicles filled up to 6mm in size, aphyric 7. Matrix: fine-grained 8. Secondary Minerals: greenish vesicle filling 9. Encrustations: encrusted by breccia with thick Mn-crust	x							
SO232-DR-37-8B	1. Rock Type: same as sample DR37-8A 2. Size: 5x6x4 cm 5. Texture / Vesicularity: larger vesicles up to 1cm in size								
SO232-DR-37-8C	1. Rock Type: same as sample DR37-8A 2. Size: 5x7x7 cm 5. Texture / Vesicularity: vesicles sometimes larger (3%) up to 1.5cm in size								

SO232-DR-38

Description of Location and Structure: Eastern margin of Mozambique Ridge, east facing slope, midsection, track based on previous survey data because of problems loading newly aquired data into system






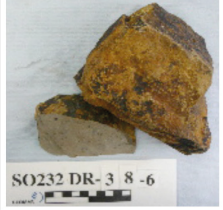

Dredge on bottom UTC 19/04/14 06:10hrs, lat 32°59.90'S, long 36°29.31'E, depth 4270m









Dredge off bottom UTC 19/04/14 07:34hrs, lat 32°59.81'S, long 36°28.68'E, depth 3678m

total volume: 1/5 full









Comments: lava fragments, surface of lava






A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-38-1	1. Rock Type: volcanic 2. Size: 7x8x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: aphyric sample, small cracks 6. Phenocrysts: not visible (or <<<1% Plg) 7. Matrix: fine-grained, ~fresh 8. Secondary Minerals: black nodules maybe Mn, ~mm-size 10. Comment: first sample of a serie, matrix is fresh -> very suitable for geochemistry	x	x				x	Ref. Sample in Alu-box 488	
SO232-DR-38-2	1. Rock Type: volcanic similar to DR38-1 2. Size: 9x10x8 cm 3. Shape / Angularity: angular	x	x						
SO232-DR-38-3	1. Rock Type: volcanic similar to DR38-1 2. Size: 18x10x8 cm 3. Shape / Angularity: angular	x	x						
SO232-DR-38-4	1. Rock Type: volcanic similar to DR38-1 2. Size: 8x9x5 cm 3. Shape / Angularity: angular 6. Phenocrysts: presence of ~fresh Plg of 1-5mm-size, >1% 10. Comment: similar to DR38-1 but the higher amount of phenocrysts makes this sample more suitable for age dating	x	x	3					
SO232-DR-38-5	1. Rock Type: volcanic similar to DR38-1 and DR38-4 2. Size: 17x10x4 cm 3. Shape / Angularity: angular 6. Phenocrysts: 1-2% ~fresh Plg, mm-size 8. Secondary Minerals: less black spots in this sample 10. Comment: Plg phenocrysts seem to have a better quality for age dating	x	x	2			x		
SO232-DR-38-6	1. Rock Type: volcanic similar to DR38-1 2. Size: 15x10x12 cm 3. Shape / Angularity: angular 6. Phenocrysts: black and white cluster, mm-size, Plg + Px? 10. Comment: backup material								
SO232-DR-38-7	1. Rock Type: volcanic similar to DR38-4 2. Size: 12x10x7 cm 3. Shape / Angularity: angular 6. Phenocrysts: Plg 2-5% ~fresh but bigger than in sample DR38-4 (2-5mm) 7. Matrix: matrix a bit more altered 10. Comment: suitable for age dating	x	x	3			x		







SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Al/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-38-8	1. Rock Type: volcanic similar to DR38-4 and DR38-7 2. Size: 14x7x7 cm 3. Shape / Angularity: angular 10. Comment: appears less suitable for age dating	x	x	4					
SO232-DR-38-9	1. Rock Type: volcanic similar to DR38-7 2. Size: 15x8x5 cm 3. Shape / Angularity: angular 10. Comment: mostly backup for geochemistry and age dating	x		4					
SO232-DR-38-10	1. Rock Type: volcanic similar to DR38-1 2. Size: 8x5x4 cm 3. Shape / Angularity: angular 7. Matrix: matrix more altered 10. Comment: backup								
SO232-DR-38-11	1. Rock Type: volcanic similar to DR38-10 2. Size: 12x7x5 cm 3. Shape / Angularity: angular 10. Comment: backup								
Note:	All the previous samples had the same lithology. Some had more phenocrysts than others, or the matrix was slightly more altered. Overall they were probably from the same volcanic event.								
SO232-DR-38-12	1. Rock Type: volcanic 2. Size: 12x5x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: no vesicles, few cracks 7. Matrix: microcrystalline matrix, less fresh than DR38-1 to DR38-11, presence of reddish minerals 8. Secondary Minerals: less and smaller black nodules 10. Comment: different lithology but still suitable for geochemistry	x	x					Ref. Sample in Alu-box 488	
SO232-DR-38-13	1. Rock Type: volcanic similar to DR38-12 2. Size: 17x14x8 cm 3. Shape / Angularity: angular 10. Comment: same as DR38-12	x	x						
SO232-DR-38-14	1. Rock Type: volcanic similar to DR38-12 2. Size: 12x6x5 cm 3. Shape / Angularity: angular 10. Comment: same as DR38-12	x	x						
SO232-DR-38-15	1. Rock Type: volcanic similar to DR38-12 2. Size: 24x22x8 cm 3. Shape / Angularity: angular 7. Matrix: less fresh matrix 10. Comment: same as DR38-12	x	x						







A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-38-16	1. Rock Type: volcanic similar to DR38-12 2. Size: 15x9x5 cm 3. Shape / Angularity: angular 5. Texture / Vesicularity: more cracks and spots 7. Matrix: same as sample DR38-14 10. Comment: backup								 SO232 DR-38-16
SO232-DR-38-17	1. Rock Type: volcanic similar to DR38-12 2. Size: 14x9x5 cm 3. Shape / Angularity: angular 7. Matrix: same as sample DR38-14 8. Secondary Minerals: one vesicle (1cm) filled with small Qz crystals. Along cracks Qz-crystallization as well 10. Comment: backup								 SO232 DR-38-17
SO232-DR-38-18	1. Rock Type: volcanic similar to DR38-12 2. Size: 7x8x4 cm 3. Shape / Angularity: angular 7. Matrix: same as sample DR38-14, maybe worse 8. Secondary Minerals: one crack is filled with Qz 10. Comment: backup								 SO232 DR-38-18
SO232-DR-38-19	1. Rock Type: volcanic similar to DR38-12 2. Size: 9x7x4 cm 3. Shape / Angularity: angular 7. Matrix: like sample DR38-14 10. Comment: backup								 SO232 DR-38-19
SO232-DR-38-20	1. Rock Type: volcanic similar to DR38-12 2. Size: 14x6x5 cm 3. Shape / Angularity: angular 10. Comment: backup								 SO232 DR-38-20
SO232-DR-38-21	1. Rock Type: volcanic similar to DR38-12 2. Size: 21x23x8 cm 3. Shape / Angularity: angular 7. Matrix: lots of very altered pieces, only one fresh part taken 10. Comment: backup - Q								 SO232 DR-38-21
SO232-DR-38-22	1. Rock Type: volcanic similar to DR38-12 2. Size: 10x5x5 cm 3. Shape / Angularity: angular 10. Comment: backup								 SO232 DR-38-22
SO232-DR-38-23	1. Rock Type: volcanic similar to DR38-12 2. Size: 6x7x4 cm 3. Shape / Angularity: angular 10. Comment: backup								 SO232 DR-38-23
Note:	Samples DR38-12 to DR38-23 are another more microcrystalline lithology; but the matrix is slightly more altered. Less samples were taken for geochemistry but more are available for backup.								








SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-38-24	1. Rock Type: volcanic 2. Size: 10x12x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey and yellow 5. Texture / Vesicularity: no vesicles, very few cracks 6. Phenocrysts: large (5mm), not so fresh Plg, 5-10% 7. Matrix: in some parts the matrix is oxidized 8. Secondary Minerals: few black nodules (~mm) 10. Comment: another lithology, with large phenocrysts but they appear altered. Use for age dating depends on thin sections.	x	x	5-6					
SO232-DR-38-25	1. Rock Type: volcanic 2. Size: 15x12x9 cm 3. Shape / Angularity: round 4. Color of cut surface: dark red 5. Texture / Vesicularity: vesicles (5%) mostly filled 7. Matrix: quite altered and oxidized 8. Secondary Minerals: most vesicles are filled with Qz, Cc, presence of Muscovite?? 10. Comment: this sample looks like a volcanic bomb with a bread-crust along the outer surface of the described core. If this is a bomb, then eruption might have been subaerial in contrast to the common submarine eruption environment observed thus far for the Mozambique Ridge.	x							
SO232-DR-38-26	1. Rock Type: volcanic similar to DR38-25 2. Size: 12x10x11 cm 3. Shape / Angularity: round 4. Color of cut surface: rather brown than red 8. Secondary Minerals: similar features as in DR38-25 9. Encrustations: no "bread-crust" but thin Mn coating	x							
SO232-DR-38-27	1. Rock Type: volcanic similar to DR38-25 and DR38-26 2. Size: 13x10x8 cm 3. Shape / Angularity: round 4. Color of cut surface: reddish 8. Secondary Minerals: similar to DR38-25 and DR38-26	x							
SO232-DR-38-28	1. Rock Type: sediment 2. Size: 7x5x4 cm 10. Comment: for archive					x			








A.6 Rock Sample Description

SO232-DR-39 Description of Location and Structure: Eastern margin of Mozambique Ridge, east facing slope, upper midsection, ca 2.5 nm north of DR38 Dredge on bottom UTC 19/04/14 10:48hrs, lat 32°57.45'S, long 36°29.42'E, depth 3889m Dredge off bottom UTC 19/04/14 12:03hrs, lat 32°57.35'S, long 36°28.91'E, depth 3412m total volume: 1/3 full Comments: lava fragments (mainly) and lithified sediments (?)									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-39-1	1. Rock Type: volcanic 2. Size: 15x13x12 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: <1% vesicles filled 7. Matrix: fine-grained, ~fresh, ± small Px 8. Secondary Minerals: vesicles filled with Mn (?), also presence of red material 10. Comment: appears well suitable for geochemical analysis	x	x					Ref. Sample in Alu-box 488	
SO232-DR-39-2	1. Rock Type: volcanic, similar to DR39-1 2. Size: 8x8x3 cm 3. Shape / Angularity: angular 5. Texture / Vesicularity: less vesicles than DR39-1 8. Secondary Minerals: Mn in vesicles and yellow material 10. Comment: similar to DR39-1, smaller piece of rock	x	x						
SO232-DR-39-3	1. Rock Type: volcanic, similar to DR39-1 2. Size: 8x8x5 cm 3. Shape / Angularity: angular 5. Texture / Vesicularity: few vesicles 7. Matrix: fresh 8. Secondary Minerals: Mn in vesicles, few reddish material 10. Comment: similar to DR39-1	x	x						
SO232-DR-39-4	1. Rock Type: volcanic, similar to DR39-1 2. Size: 10x8x5 cm 3. Shape / Angularity: angular 10. Comment: can be used as backup for fresh material								
SO232-DR-39-5	1. Rock Type: volcanic, similar to DR39-1 2. Size: 14x8x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: overall like previous samples, plus one big crack 7. Matrix: like previous samples 8. Secondary Minerals: much less Mn filling but similar reddish material as in DR39-3, crack filled with Qz 10. Comment: except the crack, it's a suitable sample	x	x						
SO232-DR-39-6	1. Rock Type: volcanic, similar to DR39-1 2. Size: 18x15x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: like previous samples 7. Matrix: less fresh matrix as in DR39-1, some alteration front in the corners 8. Secondary Minerals: some yellow filling 10. Comment: similar to previous samples	x	x						








SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-39-7	1. Rock Type: volcanic or sediment from bloc -X 2. Size: original size 21x18x14 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: very fine-grained, hard to even see microcrystals, no vesicles observed 10. Comment: if volcanic, fresh and suitable like previous samples but can also be a sediment (--> no evidence for magmatic minerals)	x	x						
SO232-DR-39-8	1. Rock Type: volcanic 2. Size: 8x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: <<<1% vesicles 6. Phenocrysts: ~2% very small Plg (<mm) but quite fresh 7. Matrix: ~fresh matrix similar to previous samples 10. Comment: the presence of micro-Plg increases the possibility for age dating and mineral separation	x	x	2					
SO232-DR-39-9	1. Rock Type: volcanic 2. Size: 11x11x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: like previous samples but contains more cracks - no vesicles 6. Phenocrysts: 2-5% small Plg; size: ~mm 7. Matrix: quite fresh 8. Secondary Minerals: few mm-large features; could be altered magmatic mineral or secondary alteration 10. Comment: can be used for age dating	x	x	2-3					
SO232-DR-39-10	1. Rock Type: volcanic, bloc -S 2. Size: original size 27x23x22 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: more cracks 6. Phenocrysts: 2% small, quite fresh Plg size: ~mm 7. Matrix: less fresh matrix--> alteration front around a fresher core 8. Secondary Minerals: less than previous samples 10. Comment: backup for mineral separation and age dating	x							
SO232-DR-39-11	1. Rock Type: volcanic 2. Size: 14x7x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: <<<1% vesicles partially filled and cracks 6. Phenocrysts: <1% not so fresh Plg 7. Matrix: definitely less fresh matrix than previous samples 8. Secondary Minerals: few white filling 10. Comment: can be used as backup for mineral separation if needed	x							
SO232-DR-39-12	1. Rock Type: volcanic 2. Size: 8x9x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: greyish 5. Texture / Vesicularity: more cracks than others 6. Phenocrysts: 1% Plg, mm-size 7. Matrix: oxidized matrix around the cracks 8. Secondary Minerals: one large crack contains Qz or Cc 10. Comment: for archive, backup								







A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-39-13	1. Rock Type: volcanic, similar to DR39-12 2. Size: 13x8x5 cm 3. Shape / Angularity: angular 10. Comment: for archive, backup								
SO232-DR-39-14	1. Rock Type: volcanic, similar to DR39-11 2. Size: 10x7x6 cm 3. Shape / Angularity: angular 10. Comment: backup for mineral separation	x							
SO232-DR-39-15	1. Rock Type: volcanic 2. Size: 11x9x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: similar to DR39-5 6. Phenocrysts: 5-10% fresh Plg, mm-size 7. Matrix: alteration front around the sample 10. Comment: suitable for whole rock geochemistry if alteration front is avoided; however the phenocrysts are fresh and the sample may be used for mineral separation and age dating	x	x	3					
SO232-DR-39-16	1. Rock Type: volcanic, similar to DR39-14 and DR39-15 2. Size: 9x6x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: cracks within the sample 6. Phenocrysts: 5% fresh Plg, mm-size 7. Matrix: fresh but oxidation around the cracks 10. Comment: can be used as backup for age dating	x							
SO232-DR-39-17	1. Rock Type: volcanic 2. Size: 12x8x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: 1% filled vesicles 6. Phenocrysts: 2-5% fresh Plg, mm-size 7. Matrix: the matrix is comparatively fresh 8. Secondary Minerals: black and white filling 10. Comment: backup for age dating and mineral separation	x							
SO232-DR-39-18	1. Rock Type: volcanic, similar to DR39-17 2. Size: 8x6x8 cm 3. Shape / Angularity: angular 10. Comment: backup but the matrix is relatively altered								
SO232-DR-39-19	1. Rock Type: volcanic 2. Size: 10x8x10 cm 3. Shape / Angularity: subangular 4. Color of cut surface: grey 5. Texture / Vesicularity: 5-10% vesicles, ~filled 6. Phenocrysts: <1% not fresh Plg 7. Matrix: lots of alteration in the matrix 10. Comment: backup	x							






SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-39-20	1. Rock Type: volcanic, similar to DR39-17 and DR39-18 2. Size: 13x10x8 cm 3. Shape / Angularity: angular 10. Comment: backup but this sample is relatively altered (matrix); Plg are \pm ok								
SO232-DR-39-21	1. Rock Type: volcanic 2. Size: 11x12x6 cm 3. Shape / Angularity: subround 4. Color of cut surface: dark grey 5. Texture / Vesicularity: 5% vesicles, partially filled 6. Phenocrysts: 2% not so fresh Plg, mm-size 7. Matrix: altered matrix 8. Secondary Minerals: yellow brown and white filling in the vesicles 10. Comment: backup for mineral separation	x							
SO232-DR-39-22	1. Rock Type: volcanic from bloc -N 2. Size: original size: 21x24x20 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 6. Phenocrysts: <1% not so fresh Plg 7. Matrix: large alteration within the sample 10. Comment: backup								
SO232-DR-39-23	1. Rock Type: volcanic 2. Size: 9x9x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: similar to DR39-22 6. Phenocrysts: <1% not fresh Plg 7. Matrix: altered matrix 10. Comment: backup								
SO232-DR-39-24	1. Rock Type: volcanic 2. Size: 10x6x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 6. Phenocrysts: 1% not fresh Plg 7. Matrix: altered matrix 10. Comment: backup								
SO232-DR-39-25	1. Rock Type: volcanic, similar to DR39-24 2. Size: 8x7x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: no vesicles, small cracks 8. Secondary Minerals: oxidation along cracks; Qz and/or Cc filling in one of them 10. Comment: backup								
SO232-DR-39-26	1. Rock Type: volcanic 2. Size: 9x7x5 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: grey/ yellowish 5. Texture / Vesicularity: 2-5% filled vesicles 7. Matrix: altered 8. Secondary Minerals: Mn filling 10. Comment: backup								



A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-39-27	1. Rock Type: volcanic 2. Size: 13x9x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 7. Matrix: ~fresh fine-grained matrix 8. Secondary Minerals: black mineralization all over the sample 10. Comment: depending on the thin section, this sample could be of interest as it petrographically differs from the other volcanics of this dredge	x	x						
SO232-DR-39-28	1. Rock Type: volcanic 2. Size: 10x7x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey to brown 6. Phenocrysts: <1% Plg, mm-size, do not appear fresh 7. Matrix: altered and oxidized matrix 10. Comment: backup								
SO232-DR-39-29	1. Rock Type: volcanic 2. Size: 10x12x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey/dark 5. Texture / Vesicularity: few vesicles and one major crack 7. Matrix: looks altered 8. Secondary Minerals: Mn filling the vesicles and along crack ± oxidation 10. Comment: backup								
SO232-DR-39-30	1. Rock Type: volcanic 2. Size: 9x9x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: 2% vesicles 7. Matrix: altered matrix 8. Secondary Minerals: Mn filling the vesicles 10. Comment: backup								
SO232-DR-39-31	1. Rock Type: volcanic 2. Size: 16x12x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey/brown 5. Texture / Vesicularity: several large cracks 7. Matrix: altered 8. Secondary Minerals: Qz filling the cracks 10. Comment: backup								
SO232-DR-39-32	1. Rock Type: volcanic, from bloc -R 2. Size: original size: 18x15x17 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: mm-large cracks 7. Matrix: ~fine-grained, not so fresh 8. Secondary Minerals: Qz filling the cracks 10. Comment: backup								
SO232-DR-39-33	1. Rock Type: volcanic 2. Size: 24x19x12 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: small cracks 6. Phenocrysts: <<1% Plg 7. Matrix: altered and oxidized matrix 10. Comment: backup								

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-39-34	1. Rock Type: volcanic 2. Size: 11x11x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: ~grey 5. Texture / Vesicularity: several cracks and vesicles 7. Matrix: some parts are fresh but mostly altered 8. Secondary Minerals: Qz and other sedimentary minerals are filling the cracks and vesicles 10. Comment: backup								
SO232-DR-39-35	1. Rock Type: volcanic 2. Size: 17x10x10 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: 5% vesicles, filled 6. Phenocrysts: 1% Plg, not fresh 7. Matrix: oxidized matrix 8. Secondary Minerals: Mn filling the vesicles 10. Comment: backup								
Note:	All of the previous samples seemed relatively similar with variations in degree of alteration, color, vesicles (\pm filling) and amount of Plg, but the matrix looks very similar overall. Many samples are therefore kept as references.								
SO232-DR-39-36	1. Rock Type: volcanic or sediment 2. Size: 17x17x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: orange/brown 5. Texture / Vesicularity: very fine-grained 7. Matrix: if volcanic, then it is totally altered but could be a solidified sediment as well 10. Comment: backup								
SO232-DR-39-37	1. Rock Type: volcanic 2. Size: 11x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: greyish 5. Texture / Vesicularity: 1% vesicles, partially filled 7. Matrix: altered 8. Secondary Minerals: white filling 10. Comment: backup								
SO232-DR-39-38	1. Rock Type: volcanic, from bloc -K 2. Size: original size: 20x24x23 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey to brown 5. Texture / Vesicularity: few vesicles in the cut section but many on the outside 6. Phenocrysts: maybe some Plg 7. Matrix: altered 10. Comment: backup								
SO232-DR-39-39-X	1. Rock Type: volcanic, maybe sediment 2. Size: 5x8x7 cm 3. Shape / Angularity: round 4. Color of cut surface: red 5. Texture / Vesicularity: 10-20% vesicles filled 7. Matrix: oxidized matrix 8. Secondary Minerals: Qz and Cc filling 10. Comment: archive								

A.6 Rock Sample Description

SO232-DR-40 Description of Location and Structure: Eastern margin of Mozambique Ridge, east facing slope, upper mid-section, ca 15 nm north of DR39 Dredge on bottom UTC 19/04/14 17:44hrs, lat 32°42.14'S, long 36°32.77'E, depth 3988m Dredge off bottom UTC 19/04/14 19:03hrs, lat 32°41.94'S, long 36°32.21'E, depth 3575m total volume: 1/6 full Comments: solidified mud rocks; no volcanics									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-40-1	1. Rock Type: mudstone 2. Size: 10x7x6 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: brown-beige 5. Texture / Vesicularity: dense 7. Matrix: dense, extremely fine-grained -> clay 9. Encrustations: thin Mn coating 10. Comment: one of many others of this rocktype	x				x			
SO232-DR-40-2-X	1. Rock Type: mudstone, similar to sample DR40-1 2. Size: 18x15x4 cm 9. Encrustations: Mn coating					x			
SO232-DR-41 Description of Location and Structure: eastern margin of Moz.-Ridge, steep east facing slope, track across small nose in lower section Dredge on bottom UTC 19/04/14 22:15hrs, lat 32°45.86'S, long 36°32.34'E, depth 4268m Dredge off bottom UTC 19/04/14 23:33hrs, lat 32°46.25'S, long 36°31.92'E, depth 3908m total volume: 5 pieces Comments: angular lava fragments									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-41-1	1. Rock Type: volcanic, pillow fragment, moderately altered 2. Size: 13x11x9 cm 3. Shape / Angularity: angular with upper round surface 4. Color of cut surface: grey to light brown 5. Texture / Vesicularity: porphyric, some cracks filled with Mn, 20% filled vesicles up to 2mm in size 6. Phenocrysts: Fsp <1mm needles, ~10%; Px (?) up to 3mm, ~7% 7. Matrix: fine-grained with Fsp as part of matrix 8. Secondary Minerals: vesicle fillings, Mn (black, red mineral sometimes green in interior (2mm)) 9. Encrustations: Mn coating	x	x	2-3				Ref. Sample in Alu-box 488	
SO232-DR-41-2	1. Rock Type: volcanic, similar to sample DR41-1 2. Size: 19x10x6 cm 3. Shape / Angularity: angular 9. Encrustations: ~1mm thick Mn-crust	x	x						
SO232-DR-41-3	1. Rock Type: volcanic, similar to sample DR41-1 2. Size: 10x6x4 cm 5. Texture / Vesicularity: larger crack (>1mm-wide) partly filled with yellowish material 9. Encrustations: thin Mn coating	x		2-3					

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-41-4	1. Rock Type: volcanic, slightly altered 2. Size: 10x7x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, dense 6. Phenocrysts: Fsp needles, <1mm, 20-25% Px or Mn fillings 7. Matrix: fine-grained 8. Secondary Minerals: red secondary minerals, up to 1mm size, sometimes green cores) 9. Encrustations: 1mm Mn-crust	x							
SO232-DR-41-5-X	1. Rock Type: breccia with small volcanic clasts within greenish matrix 2. Size: 9x6x3 cm 9. Encrustations: 3mm Mn-crust	x							




SO232-DR-42
Description of Location and Structure: Eastern margin of Mozambique Ridge, east facing slope, central section track oblique to dip

Dredge on bottom UTC 20/04/14 05:26hrs, lat 32°33.55'S, long 36°34.18'E, depth 4276m



Dredge off bottom UTC 20/04/14 06:57hrs, lat 32°33.93'S, long 36°34.30'E, depth 3800m





total volume: 5 pieces


Comments: lava fragments

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-42-1	1. Rock Type: volcanic or sediment 2. Size: 9x5x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, light reddish 5. Texture / Vesicularity: no apparent vesicles; very fine-grained 7. Matrix: if volcanic, then matrix is altered 8. Secondary Minerals: several mm-size Mn 10. Comment: hard to determine if it's volcanic (no evidence for) or simply solidified sediment	x	x						
SO232-DR-42-2	1. Rock Type: volcanic or sediment, similar to DR42-1 2. Size: 8x5x3 cm 10. Comment: same as DR42-1, too small to be used for geochemistry	x							
SO232-DR-42-3	1. Rock Type: volcanic 2. Size: 7x5x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown/grey 5. Texture / Vesicularity: ~2-5% filled vesicles, aphyric 7. Matrix: quite altered 8. Secondary Minerals: Mn filling the vesicles 10. Comment: taken for geochemistry but appears of limited use	x	x						

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GLUMIN	SED	REF	NOTES	PICTURE
SO232-DR-42-4	1. Rock Type: volcanic 2. Size: 11x10x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: red 5. Texture / Vesicularity: 2-5% filled vesicles, fine-grained 6. Phenocrysts: maybe mm-size Plg (<1%) 7. Matrix: oxidized matrix 8. Secondary Minerals: Mn, Qz ± Cc filling the vesicles 10. Comment: not suitable for geochemical analysis	x							
SO232-DR-42-5	1. Rock Type: volcanic, similar to DR42-4 2. Size: 6x5x4 cm 7. Matrix: oxidized matrix 10. Comment: similar rock than DR42-4 but too small to be used; taken as backup								

SO232-DR-43 Description of Location and Structure: Eastern margin of Mozambique Ridge, steep east facing slope, flank of small nose at the base of the slope Dredge on bottom UTC 20/04/14 10:41hrs, lat 32°35.76'S, long 36°35.63'E, depth 4693m Dredge off bottom UTC 20/04/14 12:00hrs, lat 32°35.46'S, long 36°35.17'E, depth 4219m total volume: 6 rocks Comments: altered volcanics, lithified sediment									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GLUMIN	SED	REF	NOTES	PICTURE
SO232-DR-43-1	1. Rock Type: volcanic or sediment 2. Size: 10x11x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: light brown / grey 5. Texture / Vesicularity: fine-grained, no cracks or vesicles 7. Matrix: if volcanic, then very altered 10. Comment: Even under the binocular, there is no evidence for a volcanic rock; could be a solidified sediment.	x	x						
SO232-DR-43-2	1. Rock Type: volcanic 2. Size: 8x6x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: red 5. Texture / Vesicularity: fine-grained, a few very small vesicles 6. Phenocrysts: 1% not fresh Plg 7. Matrix: matrix entirely oxidized 9. Encrustations: a thin (<1mm) Mn coating on one side of the sample 10. Comment: not suitable for geochemical analysis								
SO232-DR-43-3	1. Rock Type: volcanic or sediment, similar to DR43-1 2. Size: 12x6x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey/ brownish 5. Texture / Vesicularity: like DR43-1 and numerous cracks 8. Secondary Minerals: oxidation rims along the cracks, 1-2 Mn nodules 10. Comment: same as DR43-1								
SO232-DR-43-4	1. Rock Type: sediment 2. Size: 13x6x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: yellow 5. Texture / Vesicularity: very fine-grained 10. Comment: solidified sediment					x			

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-43-5	1. Rock Type: sediment, same as DR43-4 2. Size: 8x5x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: yellow 5. Texture / Vesicularity: like DR43-4, few cracks 10. Comment: most probably sediment					x			

SO232-DR-44





Description of Location and Structure: Eastern margin of Mozambique Ridge, volcanic structure formed of several cones (?) at the upper edge of the steep scarp

Dredge on bottom UTC 20/04/14 18:07hrs, lat 32°20.72'S, long 36°35.88'E, depth 3193m



Dredge off bottom UTC 20/04/14 19:25hrs, lat 32°20.45'S, long 36°35.35'E, depth 2763m

total volume: 1/2 rocks

Comments: Mn crusts growing over volcanoclastics, 1x rounded gneiss dropstone with thin Mn crust, 1x lava within volcanoclastics

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-44-1	1. Rock Type: lava-fragment attached to volcanoclastica, moderately fresh 2. Size: 10x8x7 cm (total), 11x3x7 cm (Lava-clast) 3. Shape / Angularity: lava= angular, volc.clast= subrounded 4. Color of cut surface: lava= grey, volc.clast= brown/orange 5. Texture / Vesicularity: lava= aphyric, up to 2mm vesicles, partially filled 7. Matrix: fine-grained, vesicular 8. Secondary Minerals: fillings in vesicles, greenish or orange 9. Encrustations: Mn patches 10. Comment: volcanoclastica contains mostly angular clasts (red, yellow), matrix-supported	x	(x)					Ref. Sample in Alu-box 488	
SO232-DR-44-2	1. Rock Type: volcanic, altered 2. Size: 10x7x5 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: brown 5. Texture / Vesicularity: aphyric, dense, some cracks filled with Mn and yellow material 7. Matrix: fine-grained, micro-Fsp, relatively fresh 8. Secondary Minerals: Mn and white material in cracks 9. Encrustations: Mn patches	x	(x)						
SO232-DR-44-3-X	1. Rock Type: sedimentary 2. Size: 10x9x8 cm 4. Color of cut surface: green-yellow 7. Matrix: fine-grained 9. Encrustations: thin Mn-crust					x			
SO232-DR-44-4-X	1. Rock Type: volcanoclastica, same material as the one attached to sample DR44-1 2. Size: 12x9x8 cm 7. Matrix: fine-grained								

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-44-5-X	1. Rock Type: crystalline, gneiss, most likely dropstone 2. Size: 17x13x12 cm 7. Matrix: fine-grained 9. Encrustations: several mm-thick Mn coating 10. Comment: other crusts of this dredge contain Mn-crusts up to several cm	x							
SO232-DR-44-6-Mn	1. Rock Type: Mn, part of a larger crust 2. Size: 43x47x16 cm 7. Matrix: fine-grained 10. Comment: >7cm-thick, representative for all crusts found in this dredge								

SO232-DR-51



Description of Location and Structure: Central western Mozambique Ridge; NW-slope of pancake-like structure, this is the northern tip of the SW-plateau





Dredge on bottom UTC 26/04/14 07:48hrs, lat 33°11.45'S, long 33°12.02'E, depth 3443m

Dredge off bottom UTC 26/04/14 09:09hrs, lat 33°11.93'S, long 33°12.09'E, depth 2975m






total volume: 2/3 full








Comments: lava fragments, volcanoclastica, lithified Sediments, Mn crusts

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-51-1	1. Rock Type: volcanic 2. Size: 23x14x15 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: >10% mm-size fresh Plg 7. Matrix: relatively fresh with some altered parts 8. Secondary Minerals: few altered minerals 9. Encrustations: very thin Mn coating 10. Comment: suitable for geochemical analysis and age dating; refers to bloc J in other pictures	x	x	2-3			x	Ref. Sample in Alu-box 488	
SO232-DR-51-2	1. Rock Type: volcanic 2. Size: 9x14x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: porphyric, no vesicles, one large crack 6. Phenocrysts: 15-20% mm-size moderately fresh Plg; 1-2 fresh Ol observed (<1mm-size) 7. Matrix: relatively fresh but slightly more altered than sample DR51-1 8. Secondary Minerals: see sample DR51-1 9. Encrustations: see sample DR51-1 10. Comment: suitable for geochemical analysis and age dating; careful with handpicking	x	x	3-4					




SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-51-3	1. Rock Type: volcanic 2. Size: 37x17x14 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: 10% mm-size moderate fresh Plg 7. Matrix: relatively fresh but slightly more altered than sample DR51-1 8. Secondary Minerals: see sample DR51-1 9. Encrustations: a lot of sediment (mudstone) around this sample 10. Comment: suitable for geochemical analysis and age dating; careful with handpicking, labeled as bloc T in other pictures	x	x	3-4					
SO232-DR-51-4	1. Rock Type: volcanic 2. Size: 24x20x15 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey, orange in one corner 5. Texture / Vesicularity: porphyric, altered glass in one corner 6. Phenocrysts: 5-10% mm-size Plg - less fresh than in previous samples 7. Matrix: relatively fresh but slightly more altered than sample DR51-1; glass is altered; some patches of crystallized magma within glass 8. Secondary Minerals: see sample DR51-1 9. Encrustations: 1cm-thick Mn-crust at one corner 10. Comment: limited use for geochemical analysis; suitable for age dating; labeled as O in other pictures	x	x	4-5					
SO232-DR-51-5	1. Rock Type: volcanic 2. Size: 13x11x13 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: dark red 5. Texture / Vesicularity: porphyric, no vesicles, some cracks 6. Phenocrysts: 10-20% mm-size relatively fresh Plg, Ol (?) 7. Matrix: seems to be relatively altered, same patches as in sample DR51-4 8. Secondary Minerals: see sample DR54-1 9. Encrustations: 2-3cm-thick Mn-crust, some white material (Cc ?) with Mn 10. Comment: limited use for geochemical analysis and for age dating; O and/or He isotopes on Ol (?)	x	x	4-5					
SO232-DR-51-6	1. Rock Type: volcanic 2. Size: 23x17x14 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: 10% mm-size not very fresh Plg 7. Matrix: relatively fresh but some patches of oxidation 9. Encrustations: mm-thick Mn-crust 10. Comment: will be used as backup for mineral separation; labeled as L in other pictures	x							

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-51-7	1. Rock Type: volcanic 2. Size: 14x12x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: porphyric, no vesicles, cracks 6. Phenocrysts: 10% mm-size not very fresh Plg, 1 Ol (?) 7. Matrix: relatively fresh but some patches of oxidation 8. Secondary Minerals: see sample DR51-1, some sedimentation between cracks 10. Comment: will be used as backup for mineral separation	x							
SO232-DR-51-8	1. Rock Type: volcanic 2. Size: 13x14x12 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: dark grey, orange rim 5. Texture / Vesicularity: porphyric, no vesicles, cracks 6. Phenocrysts: 10% 5mm-size relatively fresh Plg 7. Matrix: quite oxidized matrix; orange rim is altered glass; similar patches as in sample DR51-4 8. Secondary Minerals: see sample DR51-1 9. Encrustations: 1cm-thick Mn-crust 10. Comment: will be used as backup for mineral separation	x							
SO232-DR-51-9	1. Rock Type: volcanic 2. Size: 20x13x11 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: dark grey 5. Texture / Vesicularity: porphyric, no vesicles, some cracks 6. Phenocrysts: 10% 5mm-size not so fresh Plg, Ol (?) 7. Matrix: quite oxidized matrix 8. Secondary Minerals: see sample DR51-1, probably Qz or Cc in one crack 9. Encrustations: 1-2cm-thick Mn-crust at one corner 10. Comment: will be used as backup for mineral separation	x							
SO232-DR-51-10	1. Rock Type: volcanic 2. Size: 17x12x8 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: dark grey/red 5. Texture / Vesicularity: porphyric, no vesicles, some cracks 6. Phenocrysts: 5-10% mm-size not so fresh Plg 7. Matrix: quite altered and oxidized matrix 8. Secondary Minerals: see sample DR51-1 9. Encrustations: Mn-crust 10. Comment: will be used as backup for mineral separation	x							
Note	Samples DR51-1-10 have the same porphyric lithology with variable degree of alteration, most are suitable for geochemical analysis and age dating; presence of Ol in two samples; evidence for rapid quenching (altered glass)								
SO232-DR-51-11	1. Rock Type: breccia 2. Size: 22x15x9 cm 3. Shape / Angularity: rounded 4. Color of cut surface: yellow/brown 5. Texture / Vesicularity: 3-5cm-size volcanic clasts (altered) in yellow sedimentary matrix 8. Secondary Minerals: many different secondary minerals 9. Encrustations: large Mn-crust 10. Comment: the clasts are too altered and therefore not suitable	x							

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-51-12	1. Rock Type: breccia but rather sediment 2. Size: 20x13x7 cm 3. Shape / Angularity: rounded 4. Color of cut surface: greenish/reddish 5. Texture / Vesicularity: conglomerate of different material -> probably small volcanic clasts (<1cm) 8. Secondary Minerals: a lot of secondary minerals 9. Encrustations: thin Mn-crust	x							
SO232-DR-51-13	1. Rock Type: most probably sediment 2. Size: 28x15x12 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: grey 5. Texture / Vesicularity: fine-grained, stratification observable 9. Encrustations: thin Mn-crust	x				x			
SO232-DR-51-14	1. Rock Type: breccia, similar to sample DR51-12 2. Size: 20x17x10 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: see sample DR51-12 5. Texture / Vesicularity: see sample DR51-12 9. Encrustations: very thin Mn-crust	x							
SO232-DR-51-15	1. Rock Type: sediment, mudstone 2. Size: 20x13x10 cm 3. Shape / Angularity: rounded 4. Color of cut surface: white 10. Comment: one piece taken representative from a lot of similar material in this dredge					x			
SO232-DR-51-16-Mn	1. Rock Type: Mn sample 2. Size: 35x32x19 cm 3. Shape / Angularity: stratified 10. Comment: labeled as W in other pictures								
SO232-DR-51-17	1. Rock Type: sediment, mudstone 2. Size: 10x9x7 cm 3. Shape / Angularity: rounded 4. Color of cut surface: yellowish 10. Comment: one piece taken representative from a lot of similar material in this dredge					x			
SO232-DR-51-18	1. Rock Type: sediment, mudstone 2. Size: 41x28x13 cm 3. Shape / Angularity: rounded 4. Color of cut surface: yellowish 10. Comment: one piece taken representative from a lot of similar material in this dredge; labeled as I in other pictures					x			

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-51-19X	1. Rock Type: same lithology as sample DR51-1, but more altered 2. Size: 10x11x12 cm 10. Comment: archive								
SO232-DR-51-20X	1. Rock Type: same lithology as sample DR51-1, but more altered 2. Size: 10x8x11 cm 10. Comment: archive								
SO232-DR-51-21X	1. Rock Type: same lithology as sample DR51-1, but more altered 2. Size: 15x10x8 cm 10. Comment: archive								

SO232-DR-52



Description of Location and Structure: Central western Mozambique Ridge; N-slope of pancake-like structure, lower step of slope about 15 nm E of DR 51





Dredge on bottom UTC 26/04/14 14:09hrs, lat 33°05.118'S, long 33°29.358'E, depth 3614m

Dredge off bottom UTC 26/04/14 15:36hrs, lat 33°05.535'S, long 33°29.141'E, depth 3429m

total volume: 1/8 full

Comments:

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-52-1	1. Rock Type: volcanic, moderately fresh 2. Size: 9x7x4 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, dense, some cracks 6. Phenocrysts: 25-30% up to 4mm-size Plg; 5% up to 2mm-size darker minerals (Px?) 7. Matrix: dense, fine-grained 8. Secondary Minerals: some of the Plg altered 9. Encrustations: small Mn patches 10. Comment: fresh; only lava sample of this dredge	x	x	2-3			x	Ref. Sample in Alu-box 488	
SO232-DR-52-2	1. Rock Type: sediment 2. Size: 11x7x6 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: white with Mn-fillings in vesicles and cracks 5. Texture / Vesicularity: clayey, 30% up to cm-size vesicles unfilled or filled with Mn 7. Matrix: clayey 8. Secondary Minerals: Mn 9. Encrustations: thin Mn coating or patches	x				x			

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-52-3	1. Rock Type: breccia 2. Size: 9x6x5 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: matrix white (similar to sample DR52-2), clasts altered brown or green 5. Texture / Vesicularity: matrix-supported 6. Phenocrysts: matrix-supported, clasts angular and up to 1cm-large at one corner of the rock, the rest much finer but still the same type of clasts (up to 2mm in size) 7. Matrix: similar to sample DR52-2 9. Encrustations: up to 2mm Mn-crust 10. Comment: probably volcanoclastica	x							
SO232-DR-52-4-Mn	1. Rock Type: Mn sample, altered volcanic core (1-2cm) surrounded by 2mm-thick Mn-crust 2. Size: 9x7x6 cm								
SO232-DR-52-5-Mn	1. Rock Type: Mn-crust 2. Size: 14x10x7 cm 10. Comment: no rock core visible								
SO232-DR-52-6X	1. Rock Type: hollow in centre, rock or fossil ? 2. Size: 10x7x6 cm 3. Shape / Angularity: rounded 10. Comment: labeled as sample Y in other pictures								

SO232-DR-53



Description of Location and Structure: Central western Mozambique Ridge; N-slope of pancake-like structure, upper step of slope about 1.5 nm S of DR52

Dredge on bottom UTC 26/04/14 18:18hrs, lat 33°06.68'S, long 33°30.839'E, depth 2898m






Dredge off bottom UTC 26/04/14 19:44hrs, lat 33°7.275'S, long 33°30.256'E, depth 2402m





total volume: few rocks and crusts

Comments: 3x large Mn-crusts, several smaller encrusted lava fragments

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-53-1	1. Rock Type: volcanic, pillow fragment, altered 2. Size: 12x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey, partly brown 5. Texture / Vesicularity: porphyric, 5% up to 6mm-size vesicles, partly filled; lots of Mn-filled cracks 6. Phenocrysts: 3% Plg phenocrysts 7. Matrix: dense, fine-grained 8. Secondary Minerals: vesicle fillings, Mn, white material 9. Encrustations: up to 4mm Mn-crust on one side 10. Comment: chilled margin on one side; some glass in chilled margin	x	x	4				Ref. Sample in Alu-box 488	
SO232-DR-53-2	1. Rock Type: volcanic, pillow fragment, altered, similar to sample DR53-1 2. Size: 13x7x5 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: grey on the outside; brown in the centre 5. Texture / Vesicularity: porphyric, 3% few mm-size vesicles filled with Mn and white material, cracks 6. Phenocrysts: 3mm Plg phenocrysts 7. Matrix: fine-grained 8. Secondary Minerals: Mn, white material (Cc?) 9. Encrustations: 3mm Mn-crust on one side	x	x						








A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-53-3	1. Rock Type: similar to sample DR53-1 2. Size: 12x8x6 cm 10. Comment: chilled margin up to 1cm	x	x						 A photograph of a rock sample labeled SO232 DR 5 3-3. The rock is a light brown, irregularly shaped fragment. A scale bar is visible below the sample.
SO232-DR-53-4	1. Rock Type: volcanic 2. Size: 7x5x4 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: brown centre, grey outside 5. Texture / Vesicularity: 5% up to 5mm-size mostly unfilled vesicles, cracks, porphyric 6. Phenocrysts: 2% up to 3mm-size Plg 7. Matrix: fine-grained 8. Secondary Minerals: Mn, some brown / white vesicle fillings 9. Encrustations: Mn patches 10. Comment: similar to sample DR53-1, less phenocrysts	x							 A photograph of a rock sample labeled SO232 DR 5 3-4. The rock is a light brown, irregularly shaped fragment. A scale bar is visible below the sample.
SO232-DR-53-5	1. Rock Type: similar to sample DR53-4, pillow fragment 2. Size: 7x7x5 cm 3. Shape / Angularity: angular 5. Texture / Vesicularity: up to 5mm-size hardly filled vesicles 10. Comment: chilled margin recognizable	x							 A photograph of a rock sample labeled SO232 DR 5 3-5. The rock is a light brown, irregularly shaped fragment. A scale bar is visible below the sample.
SO232-DR-53-6	1. Rock Type: similar to sample DR53-1, more altered 2. Size: 11x10x6 cm 3. Shape / Angularity: subrounded 5. Texture / Vesicularity: larger and more cracks 9. Encrustations: >1cm Mn-crust on one side 10. Comment: >1cm chilled margin	x							 A photograph of a rock sample labeled SO232 DR 5 3-6. The rock is a light brown, irregularly shaped fragment. A scale bar is visible below the sample.
SO232-DR-53-7-Mn	1. Rock Type: Mn-sample 2. Size: 24x14x7 cm 3. Shape / Angularity: subrounded								 A photograph of a rock sample labeled SO232 DR 5 3-7 Mn. The rock is a dark, irregularly shaped fragment. A scale bar is visible below the sample.




SO232-DR-54 Description of Location and Structure: Central western Mozambique Ridge; NE-slope of pancake-like structure, beneath plateau Dredge on bottom UTC 27/04/14 00:42hrs, lat 33°19.68'S, long 33°50.37'E, depth 2785m Dredge off bottom UTC 27/04/14 02:04hrs, lat 33°19.61'S, long 33°49.80'E, depth 2375m total volume: few rocks Comments: 2x Mn crusts, 4x Mn-crust fragments									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-54-1-Mn	1. Rock Type: Mn-crust 2. Size: 46x35x17 cm; sample taken 22x20x10 cm 10. Comment: original sample labeled as M in other pictures								
SO232-DR-55 Description of Location and Structure: Top area of central plateau of Mozambique Ridge; small NE-SW trending ridge N-flank, basement outcrop according to seismic profile AWI-20140217 Dredge on bottom UTC 27/04/14 10:01hrs, lat 32°51.40'S, long 34°55.94'E, depth 1577m Dredge off bottom UTC 27/04/14 11:14hrs, lat 32°51.79'S, long 34°55.92'E, depth 1345m total volume: few rocks Comments: Mn-crusts and nodules, sediment									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-55-1	1. Rock Type: sediment 2. Size: 8x5x5 cm 3. Shape / Angularity: rounded 4. Color of cut surface: light brown 5. Texture / Vesicularity: fine-grained solidified sediment 9. Encrustations: several cm-thick Mn-crust 10. Comment: taken as reference	x				x			
SO232-DR-55-2	1. Rock Type: Mn-crust 2. Size: 23x14x11 cm 10. Comment: taken as Mn-sample								
SO232-DR-55-3	1. Rock Type: Mn nodule 2. Size: 9x6x5 cm 10. Comment: taken as Mn-sample								

A.6 Rock Sample Description

SO232-DR-56 Description of Location and Structure: Top area of central plateau of Mozambique Ridge; Same structure as DR55, N-flank, about 4 nm further east Dredge on bottom UTC 27/04/14 13:57hrs, lat 32°50.53'S, long 35°00.18'E, depth 1536m Dredge off bottom UTC 27/04/14 15:00hrs, lat 32°50.95'S, long 35°00.16'E, depth 1365m total volume: 1/4 full Comments: Mn-crusts and nodules, lithified sediment								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES
SO232-DR-56-1	1. Rock Type: volcanic, moderately fresh 2. Size: 9x7x2 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: grey to light brown 5. Texture / Vesicularity: porphyric, dense, <1% filled with Mn 6. Phenocrysts: 7% up to 3mm-size Plg phenocrysts, 7% up to 2mm-size Px phenocrysts, sometimes amalgamation visible (agglomerates) 7. Matrix: dense, fine-grained 8. Secondary Minerals: Mn-fillings in vesicles 9. Encrustations: Mn patches	x		4-5			x	Ref. Sample in Alu-box 488
SO232-DR-56-2	1. Rock Type: volcanic, altered 2. Size: 19x20x7 cm 3. Shape / Angularity: angular in rounded Mn-crust 4. Color of cut surface: brownish - grey 5. Texture / Vesicularity: porphyric, 15% up to 4mm-size partly filled vesicles 6. Phenocrysts: <1% up to 2mm-size Plg needles, <1% green-brown mineral (Px?) 7. Matrix: fine-grained 8. Secondary Minerals: Mn-fillings in vesicles and cracks, yellow alteration 9. Encrustations: Mn-crust varying in thickness (1-3cm)	x	x					
SO232-DR-56-3	1. Rock Type: sedimentary 2. Size: 8x6x5 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: brown-yellow 7. Matrix: equi-granular, fine-grained 8. Secondary Minerals: Mn along cracks on outer rim of rock 9. Encrustations: Mn patches	x				x		
SO232-DR-56-4	1. Rock Type: sedimentary, breccia 2. Size: 11x8x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: yellow - red - white 9. Encrustations: thin Mn coating	x						
SO232-DR-56-5	1. Rock Type: similar to sample DR56-4 but more Mn within breccia 2. Size: 20x10x10 cm 3. Shape / Angularity: angular	x						

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-56-6	1. Rock Type: similar to sample DR56-4 but darker and more altered 2. Size: 10x8x5 cm 3. Shape / Angularity: angular	x							
SO232-DR-56-7-Mn	1. Rock Type: clast like sample DR56-4 in centre (few cm) and thick Mn-crust (with layers of interior material within) around it 2. Size: 9x9x5 cm 3. Shape / Angularity: rounded 9. Encrustations: Mn-crust about 2cm-thick (interrupted)	x							
SO232-DR-56-8-Mn	1. Rock Type: Mn-crust with outer rock-like crust (?) 2. Size: 20x11x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: Mn black, crust reddish brown 9. Encrustations: encrusted by orange material, Mn only on the inside of rock (few Mn-patches outside)	x							
SO232-DR-56-9-Mn	1. Rock Type: Mn with outer crust, similar to sample DR56-8 2. Size: 13x9x11 cm 3. Shape / Angularity: angular	x							
SO232-DR-56-10-Mn	1. Rock Type: Mn nodule 2. Size: 6x5x5 cm 3. Shape / Angularity: angular								
SO232-DR-56-11-Mn	1. Rock Type: Mn-crust, sediment on one side 2. Size: 26x45x15 cm 3. Shape / Angularity: angular 9. Encrustations: up to 9cm-thick								
SO232-DR-56-12-X	1. Rock Type: bone / fossil 2. Size: 17x7x7 cm	x							

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-56-13-Mn	1. Rock Type: Mn nodule, similar to sample DR56-8 2. Size: 10x8x8 cm 10. Comment: cracks mainly in centre of nodule								
SO232-DR-56-14-Mn	1. Rock Type: similar to sample DR56-8 2. Size: 13x9x8 cm								
SO232-DR-56-15-Mn	1. Rock Type: similar to sample DR56-8 2. Size: 12x10x8 cm								

SO232-DR-57



Description of Location and Structure: Top area of central plateau of Mozambique Ridge; Small NE-SW trending ridge similar to DR 55 & 56, about 10 nm SE of DR 55 & 56; NW-flank


Dredge on bottom UTC 27/04/14 18:02hrs, lat 32°54.515'S, long 35°08.36'E, depth 1547m




Dredge off bottom UTC 27/04/14 19:05hrs, lat 32°54.96'S, long 35°08.26'E, depth 1298m

total volume: few Mn-crusts







Comments: Mn-crusts, 1x sediment (?)





SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-57-1	1. Rock Type: sediment or volcanic (?) 2. Size: 8x7x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: light brown, yellow patches 5. Texture / Vesicularity: fine-grained, some cracks and mm-size pores (25%) 6. Phenocrysts: some 1mm-size brown clasts 7. Matrix: fine-grained 8. Secondary Minerals: Mn-fillings in cracks, white material in pores 9. Encrustations: thin Mn coating 10. Comment: poor evidence to determine if sample is sediment or volcanic	x							
SO232-DR-57-2-Mn	1. Rock Type: Mn-crust 2. Size: 19x15x5 cm								

SO232-DR-58 Description of Location and Structure: Top of central Mozambique Ridge; Same structure as DR57, 1.5 nm further NE, NW facing gentle slope Dredge on bottom UTC 27/04/14 20:38hrs, lat 32°53.85'S, long 35°08.66'E, depth 1533m Dredge off bottom UTC 27/04/14 21:39hrs, lat 32°54.32'S, long 35°09.60'E, depth 1333m total volume: 1x Mn nodule, 1x coral fragment Comments:									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-58-1-Mn	1. Rock Type: Mn nodule 2. Size: 20x14x9 cm 3. Shape / Angularity: round, circular 10. Comment: too small rock cores from which Mn-layers grow; max. distance core - surface 7cm								 SO232 DR 58-1 Mn

SO232-DR-59 Description of Location and Structure: Top area of Central Mozambique Ridge; Circular cone rising to ~900m b.s.l.; Fledermaus grid limited to 1116m b.s.l. --> therefore dredge map looks cut off Dredge on bottom UTC 28/04/14 01:23hrs, lat 32°45.20'S, long 35°21.14'E, depth 1210m Dredge off bottom UTC 28/04/14 05:17hrs, lat 32°45.36'S, long 35°21.02'E, depth 1143m total volume: 1/3 full Comments: problems with winch and positioning, wire stuck on ground									
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-59-1	1. Rock Type: volcanic 2. Size: 20x18x13 cm 3. Shape / Angularity: subround 4. Color of cut surface: grey 5. Texture / Vesicularity: aphyric, seems highly vesicular (20-30%), from <mm to 5mm across 7. Matrix: overall seems fresh but presence of oxidation 8. Secondary Minerals: most of vesicles are filled with whitish material 9. Encrustations: few cm-thick volcanoclastica / breccia crust, on one side only 10. Comment: one of two lava sample found in this dredge, where most of the following described samples will be breccia / volcanoclastica	x	x						Ref. Sample in Alu-box 488  SO232 DR- 59-1
SO232-DR-59-2	1. Rock Type: volcanic 2. Size: 12x17x8 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: grey 5. Texture / Vesicularity: highly vesicular (30-40%), from <mm to >5mm in size 6. Phenocrysts: mm-size altered, possibly Ol and/or Plg 7. Matrix: same as in DR59-1, slightly more altered (due to more vesicles) 8. Secondary Minerals: same as in DR59-1 10. Comment: second lava sample, smaller size and more vesicular	x	x						 SO232 DR- 59-2
SO232-DR-59-3	1. Rock Type: volcanoclastica / breccia (bloc "Q") 2. Size: original size: 30x25x11 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: light grey to dark grey 5. Texture / Vesicularity: clasts (>cm-size), highly vesicular (30-40%), mm to 5mm-size 6. Phenocrysts: altered Ol (5%) <mm-size, some are > mm-size 7. Matrix: ~altered 8. Secondary Minerals: most of vesicles are filled with Cc or similar sedimentary minerals. -->one large (5cm) white filling 10. Comment: numerous class were extracted from the sediment "matrix", limited use for geochemical analysis	x	x						 SO232 DR- 59-3

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GUMIN	SED	REF	NOTES	PICTURE
SO232-DR-59-4	1. Rock Type: volcanoclastica / breccia, similar to DR59-3 2. Size: 19x11x9 cm 3. Shape / Angularity: angular to subrounded 5. Texture / Vesicularity: same as DR59-3 with few large (cm-size) vesicles 10. Comment: similar sample to DR59-3, clasts were also extracted, even so they were generally smaller and therefore more altered. the larger vesicles presented similar filling, but in amount with more of the secondary minerals. very limited use for geochemical analysis	x	x						
SO232-DR-59-5	1. Rock Type: volcanoclastica / breccia, (bloc "E"), similar to DR59-3 2. Size: original size: 55x19x10 cm 3. Shape / Angularity: angular 5. Texture / Vesicularity: same as DR59-3 and DR59-4, some clasts present larger vesicles (> 5mm) than others 10. Comment: similar sample to DR59-3 and DR59-4, taken only for thin-section, since clasts are smaller (and therefore harder to extract).	x							
SO232-DR-59-6	1. Rock Type: volcanoclastica / breccia, similar to DR59-3, DR59-4, DR59-5 2. Size: 14x13x5 cm 3. Shape / Angularity: angular 5. Texture / Vesicularity: same as DR59-3, DR59-4 and DR59-5 but less large vesicles 10. Comment: similar rock type, taken only for thin-section	x							
SO232-DR-59-7	1. Rock Type: volcanic 2. Size: 15x7x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark brown 5. Texture / Vesicularity: highly vesicular (40-50%), > 5mm size 6. Phenocrysts: ca. 5% very altered Ol and/or Plg, mm-size 7. Matrix: ~altered and oxidized 8. Secondary Minerals: mostly unfilled vesicles, few are with white/beige minerals (Cc?) 10. Comment: a different lithology, or simply a single clast recovered without its sedimentary matrix	x							
SO232-DR-59-8	1. Rock Type: volcanoclastica / breccia (bloc "R") 2. Size: original size: 32x18x16 cm 3. Shape / Angularity: angular 4. Color of cut surface: red and beige 5. Texture / Vesicularity: highly vesicular clasts (cm-size) within white/beige sediment matrix 6. Phenocrysts: presence of mm-size very altered minerals (Ol and/or Plg) 7. Matrix: quite altered, possible presence of glass (???) 8. Secondary Minerals: obvious sedimentation as matrix (carbonate, maybe ash?) 9. Encrustations: thin Mn-crust on top 10. Comment: highly fragmented breccia very altered. presence of lava "nodules" (~5cm size)	x							
SO232-DR-59-9	1. Rock Type: volcanoclastica / breccia, same as DR59-8 2. Size: 36x15x9 cm 10. Comment: a second piece is taken, seems very similar to DR59-8. also presence of lava "nodules", slightly larger (5-7cm); they are on the other side of the mn-crust								

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-59-10	1. Rock Type: probably sediment 2. Size: 11x4x4 cm 10. Comment: taken as reference					x			
SO232-DR-59-11-X	1. Rock Type: volcanoclastica / breccia, similar to DR59-8 2. Size: 36x15x9 cm 10. Comment: taken for archive								
SO232-DR-59-12-X	1. Rock Type: volcanoclastica / breccia, similar to DR59-8 2. Size: 29x15x5 cm 9. Encrustations: large cm-thick Mn-crust on top 10. Comment: taken for archive								
SO232-DR-59-13-X	1. Rock Type: volcanoclastica / breccia, similar to DR59-8, (bloc "U") 2. Size: 39x22x4 cm 10. Comment: taken for archive								

SO232-DR-60


Description of Location and Structure: Central plateau of Mozambique Ridge; Eastern Top area, E-W-trending V-shaped structure, lower NW-slope

Dredge on bottom UTC 28/04/14 09:26hrs, lat 32°38.73'S, long 35°34.73'E, depth 1769m






Dredge off bottom UTC 28/04/14 10:55hrs, lat 32°38.79'S, long 35°34.75'E, depth 1765m








total volume: full

Comments: dredge got stuck








SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-60-1	1. Rock Type: volcanic 2. Size: 9x9x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 6. Phenocrysts: 5-7%, mm-size, white minerals seem to be very fresh Plg 7. Matrix: fine-grained; fresh 10. Comment: at first glance it looks volcanic but could be also a sediment. Check thin-section before proceeding with geochemistry. However if it's volcanic, the sample is highly suitable for geochemical analysis.	x	x	? 2-3			x	Ref. Sample in Alu-box 488	


A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-60-2	1. Rock Type: volcanic, similar to DR60-1 2. Size: 10x9x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: light red 5. Texture / Vesicularity: slightly vesicular (~1%, mm-size) 6. Phenocrysts: ~5%, mm-size, same minerals as in DR60-1 7. Matrix: fine-grained, slightly altered 8. Secondary Minerals: abundant fillings and oxidation 10. Comment: same as DR60-1, but limited use for geochemistry if it's volcanic	x	x	? 2-3					
SO232-DR-60-3	1. Rock Type: volcanic, similar to DR60-1 2. Size: 14x9x10 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: 1-2% vesicles, mm- to cm-size 6. Phenocrysts: 5-7%, ca. 5mm mostly, same minerals as in DR60-1, Note: from DR60-1-DR60-3 it should be noted as Plg 7. Matrix: fine-grained, ~fresh 8. Secondary Minerals: vesicles filled with white and green minerals 9. Encrustations: partially coated with Mn-crust 10. Comment: same as DR60-1	x	x	? 3-4					
SO232-DR-60-4	1. Rock Type: volcanic, similar to DR60-1 2. Size: 11x10x10 cm 3. Shape / Angularity: angular 4. Color of cut surface: ~grey 5. Texture / Vesicularity: <1%, <mm-size, vesicles and cracks 6. Phenocrysts: 7-10%, slightly altered Plg 7. Matrix: fine-grained, ~fresh 8. Secondary Minerals: alterations along the cracks 10. Comment: similar to DR60-1	x	x	? 4					
SO232-DR-60-5	1. Rock Type: volcanic 2. Size: 11x7x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: light brown 5. Texture / Vesicularity: <1%, <mm-size vesicles 6. Phenocrysts: ~5%, mm-size Plg 7. Matrix: fine-grained, slightly altered matrix 8. Secondary Minerals: presence of oxidized minerals (red) 10. Comment: less suitable for analysis (see DR60-1 for further info)	x							
SO232-DR-60-6	1. Rock Type: volcanic 2. Size: 16x7x10 cm 3. Shape / Angularity: angular to subrounded 4. Color of cut surface: brownish 5. Texture / Vesicularity: no apparent vesicles, very small cracks 6. Phenocrysts: ~5%, mm-size, not so fresh Plg 7. Matrix: fine-grained, altered matrix 8. Secondary Minerals: alteration along the crack 10. Comment: not suitable for analysis. See DR60-1 for further information	x							

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GUMIN	SED	REF	NOTES	PICTURE
SO232-DR-60-7	1. Rock Type: volcanic 2. Size: 15x5x10 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: dark grey 5. Texture / Vesicularity: slightly vesicular (>5mm, 1%) 6. Phenocrysts: possibly 2-3% Plg, altered 7. Matrix: fine-grained, altered matrix 8. Secondary Minerals: greenish minerals (not likely to be Ol) and other white (carbonate?) filling the vesicles 10. Comment: not suitable for analysis	x							
SO232-DR-60-8	1. Rock Type: volcanic 2. Size: 15x12x9 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: vesicular (>5mm, ~5%) 6. Phenocrysts: ~2-3%, ~altered Plg (mm-size) 7. Matrix: fine-grained, altered matrix 8. Secondary Minerals: some carbonate and few fillings 10. Comment: matrix is totally altered, not suitable for analysis	x							
SO232-DR-60-9	1. Rock Type: volcanic 2. Size: 13x11x6 cm 3. Shape / Angularity: round 4. Color of cut surface: ~grey 6. Phenocrysts: 5-10% ~fresh Plg, 2-3% green primary magmatic mineral --> Ol or Cpx 7. Matrix: ~fresh 10. Comment: has been put as N°9 but sample is nicely fresh --> geochemistry suitable!	x	x				x	Ref. Sample in Alu-box 488	
SO232-DR-60-10	1. Rock Type: probably sediment 2. Size: 13x10x7 cm 3. Shape / Angularity: round 4. Color of cut surface: quite dark 7. Matrix: fine-grained 9. Encrustations: no crust, but the dark core has a "halo" composed by light component 10. Comment: possibly sedimentary, solidified; taken as reference	x				x			
SO232-DR-60-11	1. Rock Type: sediment 2. Size: 17x8x10 cm 3. Shape / Angularity: angular 4. Color of cut surface: beige / light brown 5. Texture / Vesicularity: light red clasts within beige clayey matrix 10. Comment: solidified sediment taken as reference	x				x			
SO232-DR-60-12	1. Rock Type: sediment 2. Size: 22x15x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: blackish 5. Texture / Vesicularity: blackish clasts within greenish matrix, lots of cracks 10. Comment: solidified sediment taken as reference	x				x			
SO232-DR-60-13	1. Rock Type: sediment 2. Size: 7x7x7 cm 3. Shape / Angularity: cubic (angular) 4. Color of cut surface: brownish 5. Texture / Vesicularity: fine-grained solidified sediment, 2 cracks crossing almost perfectly 10. Comment: sediment taken as reference	x				x			

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-60-14	1. Rock Type: breccia or sediment 2. Size: 11x11x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark with light brown clasts 5. Texture / Vesicularity: cm-size clasts within dark (black) matrix (→sediment) 10. Comment: taken as reference	x							
SO232-DR-60-15	1. Rock Type: sediment 2. Size: 15x11x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark 10. Comment: solidified sediment, taken as reference	x							
SO232-DR-60-16	1. Rock Type: sediment 2. Size: 14x10x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: greenish 5. Texture / Vesicularity: numerous light grey clasts with greenish matrix 10. Comment: taken as reference	x							
SO232-DR-60-17-Mn	1. Rock Type: Mn nodule with clasts inside 2. Size: 18x8x10 cm 10. Comment: taken as Mn sample								
SO232-DR-60-18-Mn	1. Rock Type: Mn nodule with orange crust (~5mm thick) 2. Size: 17x12x11 cm 10. Comment: taken as Mn sample								
SO232-DR-60-19	1. Rock Type: Carbonate (Chalk?) (bloc "A") 2. Size: original size: 29x22x11 cm 10. Comment: taken as reference								
SO232-DR-60-20-X	1. Rock Type: similar to DR60-1, more altered with cracks → archive								

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-60-21-X	1. Rock Type: volcanic or plutonic? (bloc "E") 2. Size: original size: 40x39x28 cm 3. Shape / Angularity: round 4. Color of cut surface: brown 5. Texture / Vesicularity: no apparent vesicles; 6-10% altered Plg 7. Matrix: altered 10. Comment: taken for archive								 SO232 DR- 60 -21-X

SO232-DR-61

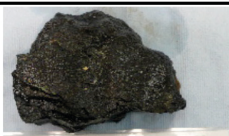
Description of Location and Structure: Central plateau of Mozambique Ridge; same structure as DR60, ~2 nm further west, N-slope from base to top

Dredge on bottom UTC 28/04/14 13:05hrs, lat 32°37.86'S, long 35°32.55'E, depth 1612m

Dredge off bottom UTC 28/04/14 14:22hrs, lat 32°38.26'S, long 35°32.32'E, depth 1284m

total volume: few rocks

Comments: Mn-crust

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-61-1-Mn	1. Rock Type: Mn-crust 2. Size: 14x10x5 cm 10. Comment: taken as Mn sample								 SO232 DR- 61-1-Mn

SO232-DR-62



Description of Location and Structure: SE corner of Northern Mozambique Ridge; eastern margin of plateau region, margin strikes NNE-SSW and is apparently of tectonic origin. SE facing slope

Dredge on bottom UTC 29/04/14 05:07hrs, lat 31°07.42'S, long 36°41.40'E, depth 4541m






Dredge off bottom UTC 29/04/14 06:27hrs, lat 31°07.06'S, long 36°41.04'E, depth 4014m








total volume: 1/6 full

Comments: lava clasts, various lithified Sediments, Mn






SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-62-1	1. Rock Type: volcanic 2. Size: 7x8x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: ~1% very small (<<1mm) vesicles and a few larger than 1mm 6. Phenocrysts: <<<1% most likely Plg (<<1mm). fresh? 7. Matrix: very fine-grained, seems fresh. 8. Secondary Minerals: secondary minerals in larger vesicles; most of the small are filled with brown material. 10. Comment: very suitable for geochemistry, careful with handpicking.	x	x				x	Ref. Sample in Alu-box 488	 SO232 DR- 62-1
SO232-DR-62-2	1. Rock Type: volcanic, similar to DR62-1 2. Size: 7x8x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: same as DR62-1 but no large vesicles 6. Phenocrysts: hard to see. maybe same as in DR62-1 7. Matrix: same as in DR62-1 8. Secondary Minerals: same type of filling as in DR62-1 10. Comment: a second lava sample from this dredge, suitable for geochemistry, handpicking required!	x	x						 SO232 DR- 62-2








A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-62-3	1. Rock Type: volcanic clast in Mn nodule 2. Size: 8x8x5 cm 3. Shape / Angularity: nodule is round, clast is subrounded 4. Color of cut surface: brownish 5. Texture / Vesicularity: seems aphyric, no apparent vesicles 7. Matrix: seems altered 8. Secondary Minerals: large presence of sediment pieces and rest of Mn-crust 9. Encrustations: ~5mm Mn coating 10. Comment: limited use for geochemical analysis	x	x						
SO232-DR-62-4	1. Rock Type: volcanic clast in Mn nodule 2. Size: 17x16x12 cm 3. Shape / Angularity: nodule is rounded, clast is subrounded 4. Color of cut surface: brown 5. Texture / Vesicularity: same as DR62-3 7. Matrix: altered 8. Secondary Minerals: same as DR62-3: presence of Mn-crust and sediment pieces 9. Encrustations: up to >5mm Mn-crust 10. Comment: limited use for geochemical analysis	x	x						
SO232-DR-62-5	1. Rock Type: small volcanic clast within Mn nodule 2. Size: 7x9x5 cm 3. Shape / Angularity: clast seems angular 4. Color of cut surface: clast is grey 5. Texture / Vesicularity: seems porphyric, 1% vesicles (mm) 6. Phenocrysts: ~1-2 not fresh white minerals, likely to be Plg 7. Matrix: relatively altered 8. Secondary Minerals: most of the nodule is filled with a brownish sediment piece 9. Encrustations: 5mm Mn coating 10. Comment: thin section will tell if the white minerals are Plg and how fresh they are for age dating	x							
SO232-DR-62-6	1. Rock Type: sediment 2. Size: 12x8x7 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: light brown 5. Texture / Vesicularity: aggregate of angular pieces within fine-grained (clay) matrix 10. Comment: taken as reference	x				x			
SO232-DR-62-7	1. Rock Type: sediment 2. Size: 11x8x7 cm 3. Shape / Angularity: rounded 4. Color of cut surface: greenish and light yellow 5. Texture / Vesicularity: angular yellow clasts within greenish matrix 10. Comment: taken as reference	x				x			



SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-62-8	1. Rock Type: sediment 2. Size: 12x10x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: white/beige 5. Texture / Vesicularity: muddy/ clayey sediment 9. Encrustations: coated with Mn 10. Comment: taken as reference	x				x			
SO232-DR-62-9	1. Rock Type: sediment 2. Size: 9x6x5 cm 3. Shape / Angularity: round 4. Color of cut surface: green/brown 5. Texture / Vesicularity: aggregate of small diverse sediment pieces 10. Comment: taken as reference	x				x			
SO232-DR-62-10	1. Rock Type: sediment 2. Size: 11x8x6 cm 3. Shape / Angularity: round 4. Color of cut surface: reddish 5. Texture / Vesicularity: aggregate of small and large sediment pieces 9. Encrustations: thin Mn coating (2-3mm) 10. Comment: taken as reference	x				x			
SO232-DR-62-11	1. Rock Type: sediment, similar to DR62-10 2. Size: 13x9x7 cm 3. Shape / Angularity: round 4. Color of cut surface: brownish 9. Encrustations: large Mn coating (2cm) 10. Comment: taken as reference	x				x			
SO232-DR-62-12	1. Rock Type: sediment 2. Size: 22x10x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown (mud) 5. Texture / Vesicularity: mudstone with Mn 9. Encrustations: large Mn coating (2cm) 10. Comment: taken as reference	x				x			
SO232-DR-62-13	1. Rock Type: sediment 2. Size: 8x6x9 cm 3. Shape / Angularity: round 4. Color of cut surface: green 5. Texture / Vesicularity: aggregate of small green clasts (sediment) with greenish matrix 9. Encrustations: coated with Mn 10. Comment: taken as reference	x				x			
SO232-DR-62-14-Mn	1. Rock Type: Mn-crust (bloc "U") 2. Size: original size: 28x18x13 cm 10. Comment: Mn-sample								

A.6 Rock Sample Description

SO232-DR-63									
Description of Location and Structure: Northern part of Mozambique Ridge; Eastern margin of plateau, lower section of steep slope at upper part of plateau margin ~30 nm north of DR62									
Dredge on bottom		UTC 29/04/14 12:51hrs, lat 30°46.29'S, long 36°42.76'E, depth 3435m							
Dredge off bottom		UTC 29/04/14 14:16hrs, lat 30°46.00'S, long 36°42.35'E, depth 2818m							
total volume:		1/8 full							
Comments:		Mn nodules							
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-63-1	1. Rock Type: volcanic 2. Size: 12x10x8 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: ~5-10%, ~fresh, mm-size Plg; presence of fresh Ol 7. Matrix: ~fresh with some alteration/oxidation, fine-grained 9. Encrustations: cm-size Mn-crust 10. Comment: very suitable for geochemistry and/or age dating. Mn-crust cut off		x	2-3					
SO232-DR-63-2	1. Rock Type: volcanic 2. Size: 7x7x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: ~10-15%, ~fresh, mm-size Plg; presence of fresh Ol, <mm-size, ~1% 7. Matrix: fresh, fine-grained 9. Encrustations: cm-size Mn-crust 10. Comment: same as DR63-1 but very low quantity. Could be useful for mineral separation.		x	2-3				Ref. Sample in Alu-box 488	
SO232-DR-63-3	1. Rock Type: volcanic 2. Size: 11x9x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: ~5-7%, ~fresh, mm-size Plg; possible presence of altered Ol 7. Matrix: fresh, fine-grained 9. Encrustations: cm-size Mn-crust 10. Comment: same as DR63-2		x	3					
SO232-DR-63-4	1. Rock Type: volcanic 2. Size: 11x8x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: ~5%, not so fresh, Plg and altered Ol 7. Matrix: partially oxidized 9. Encrustations: cm-size Mn-crust 10. Comment: same as DR63-2		x	3					
SO232-DR-63-5	1. Rock Type: volcanic 2. Size: 11x7x7 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: porphyric, no vesicles 6. Phenocrysts: ~5%, ~fresh, mm-size Plg 7. Matrix: largely altered 9. Encrustations: cm-size Mn-crust 10. Comment: not suitable for magmatic geochemistry due to alteration		x	4-5					
Note:	There is not enough material for thin sections --> All material is kep for geochemistry								

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-63-6	1. Rock Type: volcanic 2. Size: 9x7x8 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: brown 5. Texture / Vesicularity: 10-20% vesicles 7. Matrix: largely altered 8. Secondary Minerals: unknown mineral inside 9. Encrustations: cm-size Mn-crust 10. Comment: volcanic or sediment?	x							
SO232-DR-63-7	1. Rock Type: sediment 2. Size: 10x8x4 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: ~grey 5. Texture / Vesicularity: quite altered, fine-grained 9. Encrustations: cm-size Mn-crust 10. Comment: sediment taken as reference	x				x			
SO232-DR-63-8	1. Rock Type: sediment 2. Size: 10x9x7 cm 3. Shape / Angularity: round 4. Color of cut surface: light brown 5. Texture / Vesicularity: fine-grained matrix and some clasts 9. Encrustations: cm-size Mn-crust 10. Comment: sediment taken as reference	x				x			
SO232-DR-63-9	1. Rock Type: sediment 2. Size: 11x10x10 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey / brown 5. Texture / Vesicularity: vesicles, fine-grained 9. Encrustations: cm-size Mn-crust 10. Comment: sediment taken as reference	x				x			
SO232-DR-63-10	1. Rock Type: sediment 2. Size: 11x10x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: greenish 5. Texture / Vesicularity: aggregate of diverse, 5mm-size sediment clasts 9. Encrustations: >3cm-size Mn-crust 10. Comment: sediment taken as reference	x				x			
SO232-DR-63-11	1. Rock Type: sediment 2. Size: 11x10x8 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: aggregate of small round sediment pieces 9. Encrustations: cm-size Mn-crust 10. Comment: sediment taken as reference	x				x			
SO232-DR-63-12	1. Rock Type: sediment 2. Size: 11x9x6 cm 3. Shape / Angularity: rounded 4. Color of cut surface: brown 5. Texture / Vesicularity: clayey matrix with vesicles 9. Encrustations: cm-size Mn-crust 10. Comment: sediment taken as reference	x				x			

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-63-13	1. Rock Type: sediment 2. Size: 7x7x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: clayey type sediment 9. Encrustations: cm-size Mn-crust 10. Comment: sediment taken as reference	x				x			
SO232-DR-63-14-Mn	1. Rock Type: Mn sample 2. Size: 21x18x14 cm								

SO232-DR-64


Description of Location and Structure: Northern part of Mozambique Ridge; Eastern margin of plateau, upper section of steep slope, ~0.5 nm of DR62

Dredge on bottom UTC 29/04/14 16:43hrs, lat 30°46.41'S, long 36°41.88'E, depth 2897m

Dredge off bottom UTC 29/04/14 17:51hrs, lat 30°46.10'S, long 36°41.51'E, depth 2506m

total volume: few rocks, Mn encrusted semi-consolidated yellowish medium grained sediment

Comments: chain bag returned turned inside out

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-64-1	1. Rock Type: sediment 2. Size: 15x14x8 cm 3. Shape / Angularity: rounded 4. Color of cut surface: yellow- brown 9. Encrustations: 2cm-size Mn-crust					x			

SO232-DR-65


Description of Location and Structure: Suspect continental ridge E of Mozambique Ridge; N-S striking ridge with steep facing E-slope and more gentle W-slope; Track aims for base of E-slope at half moon shaped slope failure







Dredge on bottom UTC 29/04/14 23:05hrs, lat 30°35.00'S, long 36°54.18'E, depth 5042m

Dredge off bottom UTC 30/04/14 00:30hrs, lat 30°34.62'S, long 36°53.42'E, depth 4400m



total volume: few rocks + 1 large block blocking the mouth of the dredge

Comments: large block 75x63x38 shist (?), Mn-encrusted nodule + 1 angular, heavy rock; looks continental

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-65-1	1. Rock Type: gneiss, fresh 2. Size: original: 33x23x14 cm, bloc for geochemistry: 23x12x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: fairly dark grey 5. Texture / Vesicularity: dense, foliation 1-2mm, holocrystalline 6. Phenocrysts: layers of brighter minerals, layers of dark minerals (probably Fsp, dark: Px, Amph (?)) 9. Encrustations: Mn coating 10. Comment: could be a deformed plutonic rock or metamorphic rock (basalt?), check petrography carefully for datable mineral-phases (Fsp, Amph) including accessory minerals (zircon, monazite,...)	x	x	2			x	Ref. Sample in Alu-box 488	

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-65-2	1. Rock Type: fine grained plutonic rock (?) with dark-greyish layers (0.4cm) dissecting brown oxidized micro-gabbroic rock in a parallel manner. This is the large bloc which blocked the mouth of the dredge. 2. Size: original: 75x63x38 cm; GC-piece 24x13x10 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown-reddish part with dark grey layers 5. Texture / Vesicularity: fine-grained, microcrystalline 6. Phenocrysts: equigranular mineral-texture, Fsp and reddish oxidized mineral, dark layers extremely fine-grained, unclear if this is ore 8. Secondary Minerals: possible Fe-hydroxides (red) 9. Encrustations: up to 1cm Mn-crust on large block 10. Comment: check petrography whether this is really igneous or of sedimentary origin, clarify nature of grey bands, more sample material taken labeled as sample DR65-2X	x	x						
SO232-DR-65-3A	1. Rock Type: fine grained, black/greyish rock with black elongated dots 2. Size: 9x4,5x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey-black 5. Texture / Vesicularity: fine-grained 9. Encrustations: clast next to sample DR65-3B within 3cm thick Mn-crust	x							
SO232-DR-65-3B	1. Rock Type: lava fragment (?), extremely altered 2. Size: 8x5x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: porphyric, pores/vesicles (?) maybe due to alteration 6. Phenocrysts: 25% up to 3mm Fsp needles 7. Matrix: probably fine-grained 9. Encrustations: clast next to sample DR65-3A within 3cm thick Mn-crust	x							
SO232-DR-65-4	1. Rock Type: slightly foliated (marked by short black elongated stripes), metamorphic 2. Size: 11x9x5 cm 3. Shape / Angularity: subangular 4. Color of cut surface: grey 5. Texture / Vesicularity: very fine-grained pseudo-foliation (1mm spacing) 9. Encrustations: Mn-crust up to 1.5cm 10. Comment: core of Mn nodule	x							
SO232-DR-65-5	1. Rock Type: similar to sample DR65-4 2. Size: 11x8x5 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 9. Encrustations: Mn-crust up to 1cm 10. Comment: core of Mn nodule	x							
SO232-DR-65-6	1. Rock Type: grey, dense, probably metamorphic rock 2. Size: 11x7x4 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: grey 5. Texture / Vesicularity: dense, no crystals visible 9. Encrustations: 1.5cm Mn-crust 10. Comment: core of Mn nodule	x							

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-65-7	1. Rock Type: banded metamorphic rock (maybe marble?) 2. Size: 12x8x5 cm 3. Shape / Angularity: subangular 4. Color of cut surface: grey with bright bands (up to 1cm) 5. Texture / Vesicularity: extremely dense, marble-like 9. Encrustations: up to 1.5cm thick Mn-crust 10. Comment: core of Mn nodule	x							
SO232-DR-65-8	1. Rock Type: ductile and brittle deformed pegmatite 2. Size: 7x6x5 cm 3. Shape / Angularity: subangular 4. Color of cut surface: grey, white, brownish 5. Texture / Vesicularity: probably pegmatitic with mineral-sizes up to 1cm 6. Phenocrysts: Qz?, Fsp?, Fsp-augen? 9. Encrustations: up to 1.5cm thick Mn-crust 10. Comment: core of Mn nodule	x							

SO232-DR-66


Description of Location and Structure: Abyssal plain E of suspected continental ridge; N-S striking abyssal hill with steeper slope on eastern side; dredge-track on east facing slope

Dredge on bottom UTC 30/04/14 05:42hrs, lat 30°34.21'S, long 37°02.87'E, depth 4815m

Dredge off bottom UTC 30/04/14 06:41hrs, lat 30°33.75'S, long 37°02.48'E, depth 4572m

total volume: 1 rock

Comments: Mn

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-66-1	1. Rock Type: sediment 2. Size: 9x7x5 cm 3. Shape / Angularity: rounded 4. Color of cut surface: light brown 5. Texture / Vesicularity: fine-grained clay sediment 9. Encrustations: 2-3cm Mn-crust 10. Comment: taken as reference	x				x			

SO232-DR-67


Description of Location and Structure: Suspect continental ridge E of Mozambique Ridge; southern end of the ridge, E-facing slope, middle section of slope in between DR-65 and SO183-DL 5

Dredge on bottom UTC 30/04/14 10:49hrs, lat 30°33.683'S, long 36°53.424'E, depth 4034m

Dredge off bottom UTC 30/04/14 12:11hrs, lat 30°33.883'S, long 36°52.778'E, depth 3364m

total volume: 5-6 rocks

Comments: Mn-crust

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-67-1-Mn	1. Rock Type: Mn-crust 2. Size: 13x15x5 cm 10. Comment: taken as Mn sample	x							

SO232-DR-68

Description of Location and Structure: Northern Mozambique Ridge, central part; E-W striking slope, track 1 nm east of SO183-DL0, South facing slope, track oblique to dip

Dredge on bottom UTC 01/05/14 01:05hrs, lat 30°53.25'S, long 35°32.19'E, depth 2272m




Dredge off bottom UTC 01/05/14 02:06hrs, lat 30°52.89'S, long 35°31.83'E, depth 1974m

total volume: empty

Comments:





SO232-DR-69	
Description of Location and Structure: Northern Mozambique Ridge, central part; 11 nm SSW of DR68; E-W striking slope facing south. Track perpendicular to dip. Track near intersection with SW striking slope 2 nm E.	
Dredge on bottom	UTC 01/05/14 05:30hrs, lat 30°57.74'S, long 35°19.91'E, depth 2561m
Dredge off bottom	UTC 01/05/14 06:30hrs, lat 30°57.39'S, long 35°19.93'E, depth 2160m
total volume:	empty
Comments:	




SO232-DR-70	
Description of Location and Structure: Valley between northern and central Mozambique Ridge; E-W-trending depression, northern flank ± from base to top	
Dredge on bottom	UTC 01/05/14 12:24hrs, lat 31°27.78'S, long 35°17.64'E, depth 3044m
Dredge off bottom	UTC 01/05/14 13:38hrs, lat 31°27.35'S, long 35°17.59'E, depth 2390m
total volume:	3 rocks
Comments:	

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-70-1	1. Rock Type: volcanic 2. Size: 12x8x5 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: ~light brown 5. Texture / Vesicularity: aphyric, vesicular (10-20%, mm-size) 6. Matrix: fine-grained, largely altered 7. Secondary Minerals: Mn in vesicles 8. Encrustations: thin Mn coating 9. Comment: appears of limited use for geochemical analysis	x	x					Ref. Sample in Alu-box 488	
SO232-DR-70-2	1. Rock Type: volcanic 2. Size: 20x20x10 cm 3. Shape / Angularity: subangular 4. Color of cut surface: light brown 5. Texture / Vesicularity: moderately vesicular (10-20%) mostly filled 6. Phenocrysts: few percent from very altered mm(1-5)-size possibly Plg (?) 7. Matrix: largely altered. Presence of a second magma? (different matrix, more fine-grained, where most of the minerals are) 8. Secondary Minerals: Mn in vesicles and other white (Carbonate/Cc) material 9. Encrustations: thin Mn coating 10. Comment: seems not suitable for geochemical analysis	x	x						
SO232-DR-70-3-Mn	1. Rock Type: Mn-sample 2. Size: 8x11x3 cm 3. Shape / Angularity: round 4. Color of cut surface: black 5. Texture / Vesicularity: one clast (volcanic, 2cm-size) inside								

SO232-DR-71	
Description of Location and Structure: Valley between northern and central Mozambique Ridge, E-W-trending depression, N-flank, 1 nm east of DR70, upper slope above slump	
Dredge on bottom	UTC 01/05/14 16:06hrs, lat 31°27.17'S, long 35°18.17'E, depth 2615m
Dredge off bottom	UTC 01/05/14 17:04hrs, lat 31°26.94'S, long 35°18.38'E, depth 2282m
total volume:	empty
Comments:	

A.6 Rock Sample Description

SO232-DR-72									
Description of Location and Structure: Volcanic ridge at northern margin of central Mozambique Rdge, east facing slope at eastern end of ridge at its base due to limiting currents and wind									
Dredge on bottom		UTC 01/05/14 23:54hrs, lat 31°45.50'S, long 35°33.05'E, depth 2481m							
Dredge off bottom		UTC 01/05/14 01:03hrs, lat 31°45.58'S, long 35°32.36'E, depth 2147m							
total volume:		few rocks							
Comments:		volcaniclastics, lava fragments and crusts							
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-72-1	1. Rock Type: pillow fragment, moderately fresh 2. Size: 9x8x4 cm 3. Shape / Angularity: subangular 4. Color of cut surface: grey, reddish at one corner 5. Texture / Vesicularity: slightly porphyric, 30% vesicles up to 3mm in size, partly filled 6. Phenocrysts: Ol: up to 0.5cm, <1%; Px: black, mm-size, <1%; dark green mineral with red rim (not Ol but crystalline) <1% 7. Matrix: fine-grained 8. Secondary Minerals: white and brown vesicle fillings, Mn along cracks 9. Encrustations: thin Mn patches 10. Comment: probably chilled margin at one corner of the rock (<5mm), above the chilled margin is yellowish-greenish volcaniclastica attached (see sample DR72-5 and DR72-6)	x	x				x	Ref. Sample in Alu-box 488	
SO232-DR-72-2	1. Rock Type: volcanic, similar to sample DR72-1 but more altered 2. Size: 16x10x8 cm 3. Shape / Angularity: subangular 4. Color of cut surface: brown 5. Texture / Vesicularity: 40% vesicles <1mm, partly filled 6. Phenocrysts: green crystalline material, unclear whether vesicle fillings or mineral, altered red minerals 7. Matrix: fine-grained 8. Secondary Minerals: white vesicle fillings, red mineral see above 9. Encrustations: Mn patches	x	x						
SO232-DR-72-3	1. Rock Type: similar to sample DR72-1 but more altered 2. Size: 13x8x4 cm 3. Shape / Angularity: subangular 4. Color of cut surface: dark brown to grey 5. Texture / Vesicularity: porphyric, one side of rock: up to 20% <1mm partly filled vesicles; other side: vesicles up to 1cm in size, partly filled and up to 15% 6. Phenocrysts: up to 5mm red, angular, altered minerals (3-5%) 7. Matrix: fine-grained 8. Secondary Minerals: vesicle fillings, see red mineral above 9. Encrustations: Mn patches	x							
SO232-DR-72-4	1. Rock Type: identical to sample DR72-1 but more altered and slightly larger vesicles, mostly filled 2. Size: 16x13x4 cm 10. Comment: probably chilled margin again with greenish volcaniclastica on top of margin	x	x						

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-72-5	1. Rock Type: volcanoclastica 2. Size: 14x14x5 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: green 5. Texture / Vesicularity: pores, lapilli, vesicles 9. Encrustations: cracks filled with Mn, Mn patches on outside	x							
SO232-DR-72-6	1. Rock Type: volcanoclastica 2. Size: 17x19x8 cm 3. Shape / Angularity: subrounded 4. Color of cut surface: green-yellow with white parts 5. Texture / Vesicularity: pores 6. Phenocrysts: some lapilli (like sample DR72-5) up to 2.5 cm large within rock 9. Encrustations: black, up to 5mm-thick Cc rim, blacken maybe due to Mn?	x							
SO232-DR-72-7	1. Rock Type: carconate with some clasts within 2. Size: 19x15x5 cm 3. Shape / Angularity: subangular 4. Color of cut surface: white-light-red 9. Encrustations: Mn patches	x				x			

SO232-DR-73


Description of Location and Structure: Volcanic ridge at northern margin of central Moz. Ridge, 1.7nm NW of DR72, upper part NE facing slope of a cone

Dredge on bottom UTC 02/05/14 03:29hrs, lat 31°44.54'S, long 35°30.85'E, depth 2058m

Dredge off bottom UTC 02/05/14 04:25hrs, lat 31°44.85'S, long 35°30.53'E, depth 1835m

total volume: 2 rocks

Comments: Mn-crusts

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-73-1-Mn	1. Rock Type: Mn-crust 2. Size: 28x20x11 cm								

SO232-DR-74






Description of Location and Structure: Volcanic ridge at northern margin of central Moz. Ridge, 0,5nm north of DR72, east facing slope again base of ride is targeted



Dredge on bottom UTC 02/05/14 06:46hrs, lat 31°44.73'S, long 35°32.99'E, depth 2431m



Dredge off bottom UTC 02/05/14 07:36hrs, lat 31°44.79'S, long 35°32.49'E, depth 2189m

total volume: empty





Comments:

SO232-DR-85									
Description of Location and Structure: Northwestern tip of Agulhas Plateau; flat oval volcanic fracture on plateau, small cone on northern flank of volcano									
Dredge on bottom	UTC 09/05/14 11:40hrs, lat 37°2.76'S, long 25°14.78'E, depth 3530m								
Dredge off bottom	UTC 09/05/14 12:40hrs, lat 37°2.72'S, long 25°14.20'E, depth 3299m								
total volume:	few small rocks								
Comments:	2 lava fragments, lithified sediments, 1 Mn nodule, 1 small Mn-crust								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-85-1	1. Rock Type: volcanic 2. Size: 4x4x3 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: vesicular (2%, mm-size); porphyric 6. Phenocrysts: ca. 5%, 1-5mm-size, red/orange crystals; most probably very altered Ol 7. Matrix: seems quite fresh; fine-grained 8. Secondary Minerals: vesicles filled with Mn and Cc 9. Encrustations: very thin Mn coating 10. Comment: apart of the altered Ol, this sample is fresh; very small in size, the coating has not been removed to preserve most of the material (i.e. no geochemistry slab)	x	x						
SO232-DR-85-2	1. Rock Type: volcanic 2. Size: 5x5x4 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey 5. Texture / Vesicularity: similar to DR85-1 6. Phenocrysts: similar to DR85-1 7. Matrix: fresh and fine-grained 8. Secondary Minerals: vesicles filled with Mn, less Cc 9. Encrustations: slightly thicker Mn coating 10. Comment: see DR85-1	x	x						
SO232-DR-85-3	1. Rock Type: sediment 2. Size: 6x8x2 cm 3. Shape / Angularity: angular 4. Color of cut surface: dark grey 5. Texture / Vesicularity: extremely fine-grained sediment with observable layers 10. Comment: taken as reference	x				x			
SO232-DR-85-4	1. Rock Type: sediment 2. Size: 9x11x6 cm 3. Shape / Angularity: angular 4. Color of cut surface: beige 5. Texture / Vesicularity: light clay/mudstone; presence of wormholes (?) 10. Comment: taken as reference								
SO232-DR-85-5-Mn	1. Rock Type: Mn nodule 2. Size: 7x6x5 cm 10. Comment: Mn sample								

SO232-DR-86									
Description of Location and Structure: Northwestern tip of Agulhas Plateau; step at northern plateau margin, oblique to the slope due to weather and current conditions									
Dredge on bottom	UTC 09/05/14 18:37hrs, lat 36°58.88'S, long 24°57.73'E, depth 4008m								
Dredge off bottom	UTC 09/05/14 19:44hrs, lat 36°59.15'S, long 24°57.24'E, depth 3639m								
total volume:	two rocks								
Comments:	two large Mn-crust								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-86-1	1. Rock Type: volcanic clast in Mn nodule, very strongly altered 2. Size: original size of Mn-nodule: 20x17x12 cm 3. Shape / Angularity: volcanic clast is angular 4. Color of cut surface: brown 5. Texture / Vesicularity: dense, no vesicles, few cracks 6. Phenocrysts: 3-5% Plg phenocrysts up to 0.5 mm 7. Matrix: fine grained, slightly porphyric, strongly altered 8. Secondary Minerals: Mn filled cracks 9. Encrustations: surrounded by 4 cm thick Mn-crust 10. Comment: very strongly altered, no geochemistry slab made but Mn crust removed with hammer	x							
SO232-DR-86-2	1. Rock Type: volcanoclastic rock in Mn nodule 2. Size: 13x9x9 cm 3. Shape / Angularity: angular clast in round nodule 4. Color of cut surface: yellowish green 10. Comment: surrounded by 2.5 cm thick Mn-crust that was removed with hammer	x							

SO232-DR-87									
Description of Location and Structure: Northwestern tip of Agulhas Plateau; E-W striking ridge consisting of several volcanic cones, south facing slope beneath shallowest cone, track oblique to dip due to weather and current conditions									
Dredge on bottom	UTC 10/05/14 00:06hrs, lat 37°4.16'S, long 24°47.70'E, depth 3490m								
Dredge off bottom	UTC 10/05/14 01:23hrs, lat 37°3.64'S, long 24°47.20'E, depth 3189m								
total volume:	1/4 full								
Comments:	Mn-crusts, Mn encrusted volcanoclastic material, possibly some lava fragments								
SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-87-1	1. Rock Type: volcanic 2. Size: 14x8x9 cm 3. Shape / Angularity: angular 4. Color of cut surface: grey to brown 5. Texture / Vesicularity: vesicular, 30% vesicles up to 1 mm, partially filled 6. Phenocrysts: not visible, appears aphyric 7. Matrix: fine grained, few cracks 8. Secondary Minerals: green vesicle fillings, Mn fillings in cracks, white material partly in vesicles 9. Encrustations: up to 2 cm thick Mn-crust 10. Comment: strongly altered, limited use for geochemistry	x	x						
SO232-DR-87-2	1. Rock Type: volcanic similar to DR87-1 2. Size: 8x9x5.5 cm 3. Shape / Angularity: angular 4. Color of cut surface: brown 5. Texture / Vesicularity: more vesicles filled than DR87-1 8. Secondary Minerals: see DR87-1 but most vesicles are filled with brownish material 9. Encrustations: 4 cm Mn patch on ones side 10. Comment: more strongly altered than DR87-1	x	x						

A.6 Rock Sample Description

SAMPLE #	SAMPLE DESCRIPTION	TS	CHEM	Ar/Ar	GL/MIN	SED	REF	NOTES	PICTURE
SO232-DR-87-3	1. Rock Type: breccia, refers to bloc U in other pictures 2. Size: original size: 31x18x15 cm; piece taken 20x16x12 cm 3. Shape / Angularity: subangular 4. Color of cut surface: mostly reddish 9. Encrustations: thin Mn patches	x							
SO232-DR-87-4	1. Rock Type: sediment 2. Size: 8x14x8 cm 3. Shape / Angularity: subangular 4. Color of cut surface: yellowish white 8. Secondary Minerals: Mn in cracks 9. Encrustations: 5 mm Mn-crust	x							
SO232-DR-87-5-Mn	1. Rock Type: Mn-crust 2. Size: 48x42x18 cm (original); 18x18x7 (piece taken) 3. Shape / Angularity: subangular 4. Color of cut surface: yellowish white 8. Secondary Minerals: Mn in cracks 9. Encrustations: 5 mm Mn-crust	x							
SO232-DR-87-5A	1. Rock Type: very large shark (?) tooth embedded in Mn-crust 2. Size: approximate dimensions of tooth: 10x3x1 cm 9. Encrustations: 5 mm Mn-crust 10. Comment: refers to bloc T in other pictures	x							

Abbreviations in Table Header:

TS: thin section billet

CHEM: chemistry slab to prepare materials for geochemical analysis

Ar/Ar: estimate of sample quality for $^{40}\text{Ar}/^{39}\text{Ar}$ dating

GL/MIN: potential glass and / or mineral separates

SED: sediment

REF: reference sample for immediate transport to home institution after cruise

Abbreviations for Minerals and Materials:

Fsp: feldspar

Plg: plagioclase

Ol: olivine

Px: pyroxene

CPx: clinopyroxene

Opx: orthopyroxene

Cc: clacite

Mn: manganese

A.7 MMO RECORDINGS

A.7.1 MMO cover page

Regulatory source number	Country/Location	Ship name	Client/Contractor	Survey Start date (1st, 2D, 3D, 4D, OBC, VSP, etc.)	End date	Number of source vessels (e.g. vessels, airguns)	Type of source (e.g. airguns (only if in.))	Number of airguns (only if in. used)	Source (m)	Frequency (Hz)	Intensity (Pa or interval start (metres))	Shot (metres)	Method/Visual (equipment used)	Magnification (equipment used)	Height of water surface (metres)	How was animals estimated?	Number of dedicated MMOs	Training	Was PAM used?	Number of PAM operations (PAM only)	Description/Range of equipment from airguns (PAM only)	Bearing of airguns (PAM only)	Depth of observation (PAM only)	Comments/Flag record
SO232	South Africa	Mozambique Ridge	AWI	02.04.14	09.05.14	1	GI airguns	4	600	2,00-500		25.00 n	brooculars	7	13.5e		1	u	n					non-dedicated MMO UNCC UK trained, 3 untrained dedicated MMOs

A.7.2 MMO efforts

IMPORTANT: ENTER A NEW LINE ON THIS FORM IF SOURCE ACTIVITY OR WEATHER CONDITIONS CHANGE, AND AT LEAST ONCE AN HOUR. START A NEW LINE AT MIDNIGHT UTC. ONLY FILL IN THIS FORM WHEN YOU ARE CONCENTRATING ON CONTINUALLY SCANNING THE SEA SURFACE SEARCHING FOR MARINE MAMMALS.

Regulatory/ship/ reference platform number	Date	Visual Observer's/ watch operator's name(s) PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - north/ - south degrees minutes latitude	Start position - north/ - south degrees minutes longitude	Start position - east/ - west degrees minutes latitude	Start position - east/ - west degrees minutes longitude	Depth of water at start (metres)	End position - north/ - south degrees minutes latitude	End position - north/ - south degrees minutes longitude	End position - east/ - west degrees minutes latitude	End position - east/ - west degrees minutes longitude	Depth of water at end (metres)	Speed of vessel (knots)	Wind direction force (Beaufort)	Sea state	Swell height (visual only)	Visibility (visual only)	Sun glare (visual only)	Precipitation	Comments	Flag record
SO232	02.04.14v	Manuel Moser	2:34	3:30	34	0.37 s	33	13.98 e		34	9.08 s	33	16.51 e	1819.0	10.4		5 s	o	p	n	n		
SO232	02.04.14v	Manuel Moser	3:30	4:30	34	9.08 s	33	16.51 e	1819.0	34	19.22 s	33	19.52 e	1577.0	10.4 ne		5 s	o	m	n	n		
SO232	02.04.14v	Manuel Moser	4:30	4:55	34	19.22 s	33	19.52 e	1577.0	34	23.06 s	33	20.64 e	2159.0	10.5 ne		5 s	o	g	vf	n		
SO232	02.04.14v	Manuel Moser	4:55	5:30	34	23.06 s	33	20.64 e	2159.0	34	24.91 s	33	21.43 e	2291.0	3.4 ne		5 s	o	g	vf	n		
SO232	02.04.14v	Manuel Moser	5:30	6:30	34	24.91 s	33	21.43 e	2291.0	34	28.22 s	33	23.18 e	2394.0	3.8 ne		4 s	o	g	vf	n		
SO232	02.04.14v	Manuel Moser	6:30	7:17	34	28.22 s	33	23.18 e	2394.0	34	30.96 s	33	24.67 e	2391.0	3.7 n		3 s	o	g	vf	n		
SO232	02.04.14v	Raimund Schauvens	7:17	7:33	34	30.96 s	33	24.67 e	2391.0	34	32.25 s	33	25.25 e	2368.0	4.8 n		3 s	o	g	vf	n		
SO232	02.04.14v	Raimund Schauvens	7:33	8:30	34	32.25 s	33	25.25 e	2368.0	34	36.63 s	33	27.69 e	2259.0	5.2 n		3 s	o	g	vb	n		
SO232	02.04.14v	Raimund Schauvens	8:30	9:30	34	36.63 s	33	27.69 e	2259.0	34	41.37 s	33	30.19 e	2365.0	5.2 n		4 s	o	g	vb	n		
SO232	02.04.14v	Raimund Schauvens	9:30	10:30	34	41.37 s	33	30.19 e	2365.0	34	46.10 s	33	32.70 e	2417.0	5.1 n		4 s	o	g	vb	n		
SO232	02.04.14v	Raimund Schauvens	10:30	11:30	34	46.10 s	33	32.70 e	2417.0	34	50.92 s	33	25.29 e	2512.0	5.4 n		4 s	o	g	vb	n		
SO232	02.04.14v	Raimund Schauvens	11:30	12:30	34	50.92 s	33	35.29 e	2512.0	34	55.78 s	33	37.93 e	2831.0	5.4 n		4 s	o	g	vb	n		
SO232	02.04.14v	Jens Brack	12:30	13:30	34	55.78 s	33	37.93 e	2831.0	35	0.29 s	33	40.23 e	3007.0	5.2 ne		3 s	o	g	vb	n		
SO232	02.04.14v	Jens Brack	13:30	14:30	35	0.29 s	33	40.23 e	3007.0	35	5.25 s	33	42.92 e	3055.0	5.1 ne		2 s	o	g	vb	n		
SO232	02.04.14v	Jens Brack	14:30	15:30	35	5.25 s	33	42.92 e	3055.0	35	9.80 s	33	45.41 e	3496.0	5.0 ne		3 s	o	m	n	n		
SO232	02.04.14v	Jens Brack	15:30	16:30	35	9.80 s	33	45.41 e	3496.0	35	14.50 s	33	47.89 e	3613.0	5.1 ne		3 s	o	m	n	n		
SO232	02.04.14v	Jens Brack	16:30	16:30	35	14.50 s	33	47.89 e	3613.0	35	14.50 s	33	47.89 e	3613.0	5.1 ne		2 s	o	p	n	n		
SO232	03.04.14v	Manuel Moser	3:30	3:46	35	51.56 s	34	9.66 e	3678.0	35	50.26 s	34	9.70 e	3559.0	4.8 sw		5 s	o	p	n	m		
SO232	03.04.14v	Manuel Moser	3:46	4:30	35	50.26 s	34	9.70 e	3559.0	35	48.24 s	34	9.76 e	3566.0	4.1 s		5 s	o	m	n	m		
SO232	03.04.14v	Manuel Moser	4:30	5:30	35	48.24 s	34	9.76 e	3566.0	35	45.21 s	34	9.85 e	3465.0	3.3 se		5 s	o	m	n	m		
SO232	03.04.14v	Manuel Moser	5:30	5:45	35	48.24 s	34	9.76 e	3465.0	35	44.31 s	34	9.85 e	3391.0	3.2 se		6 c	o	m	n	l		
SO232	03.04.14v	Manuel Moser	5:45	6:00	35	44.31 s	34	9.85 e	3391.0	35	43.24 s	34	9.89 e	3487.0	4.8 se		6 c	o	m	n	l		
SO232	03.04.14v	Raimund Schauvens	6:00	6:30	35	43.24 s	34	9.89 e	3487.0	35	41.16 s	34	9.90 e	3483.0	4.4 se		6 c	o	m	n	l		
SO232	03.04.14v	Manuel Moser	6:30	7:30	35	41.16 s	34	9.90 e	3483.0	35	36.79 s	34	10.01 e	3563.0	4.4 se		6 c	o	m	n	l		
SO232	03.04.14v	Manuel Moser	7:30	8:30	35	36.79 s	34	10.01 e	3563.0	35	32.47 s	34	10.16 e	3784.0	4.2 e		7 c	o	g	n	n		

A.7.2 MMO efforts

Regulatory/Ship/ reference platform number	Date	Visual Observer's/ watch operator's name(s) PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source	Start position - north/ degrees - minutes south latitude	Start position - east/ degrees - minutes west longitude	Start position - north/ degrees - minutes south latitude	End position - north/ degrees - minutes south latitude	End position - east/ degrees - minutes west longitude	End position - north/ degrees - minutes south latitude	Depth of water at start position (metres)	Depth of water at end position (metres)	Speed of vessel (knots)	Wind direction (Beaufort)	Sea state (Beaufort)	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	03.04.14v	Raimund Scheuvers	8:30	9:30	f	35	37.47s	34	10.16e	34	10.26e	3784.0	3708.0	4.5e		7f	m	g	vf	n		
SO232	03.04.14v	Raimund Scheuvers	9:30	10:30	f	35	27.99s	34	10.26e	34	10.37e	3708.0	3650.0	4.5e		7f	m	g	sf	n		
SO232	03.04.14v	Raimund Scheuvers	10:30	11:30	f	35	23.51s	34	10.37e	34	10.49e	3650.0	3729.0	4.6ne		6f	m	g	vf	n		
SO232	03.04.14v	Raimund Scheuvers	11:30	12:30	f	35	18.68s	34	10.49e	34	10.62e	3729.0	3599.0	4.7n		4c	m	g	vf	n		
SO232	03.04.14v	Jens Brack	12:30	13:30	f	35	14.00s	35	10.62e	34	10.76e	3599.0	3574.0	4.7nw		2s	o	g	vf	n		
SO232	03.04.14v	Jens Brack	13:30	14:30	f	35	9.42s	34	10.76e	34	10.85e	3574.0	3014.0	4.7w		3g	o	g	vf	n		
SO232	03.04.14v	Jens Brack	14:30	15:30	f	35	4.80s	34	10.85e	34	10.96e	3014.0	3117.0	4.7w		4s	o	g	vf	n		
SO232	03.04.14v	Jens Brack	15:30	16:30	f	34	59.85s	34	10.96e	34	11.05e	3117.0	2597.0	5.1w		4s	o	m	n	n		
SO232	03.04.14v	Jens Brack	16:30	16:30	f	34	55.18s	34	11.05e	34	11.05e	2597.0	2597.0	5.3w		4s	o	p	n	n		
SO232	04.04.14v	Manuel Moser	3:30	4:30	f	34	2.02s	34	12.43e	34	12.55e	2618.0	2535.0	5.2w		7s	o	m	n	n		
SO232	04.04.14v	Manuel Moser	4:30	5:30	f	33	57.35s	34	12.55e	34	12.67e	2535.0	2435.0	4.6w		6c	m	g	vf	n		
SO232	04.04.14v	Manuel Moser	5:30	6:30	f	33	52.79s	34	12.67e	34	12.77e	2435.0	2384.0	4.5w		6f	l	g	sf	n		
SO232	04.04.14v	Manuel Moser	6:30	7:30	f	33	48.24s	34	12.77e	34	12.87e	2384.0	2480.0	4.6w		6f	l	g	sf	n		
SO232	04.04.14v	Manuel Moser	7:30	8:30	f	33	43.70s	34	12.87e	34	12.99e	2480.0	2395.0	4.6w		7f	l	g	vf	n		
SO232	04.04.14v	Raimund Scheuvers	8:30	9:30	f	33	38.85s	34	12.99e	34	13.11e	2395.0	2122.0	4.8sw		6f	l	g	vf	n		
SO232	04.04.14v	Raimund Scheuvers	9:30	9:39f		33	33.85s	34	13.11e	34	13.17e	2122.0	2070.0	5.0sw		6f	l	g	vf	n		
SO232	04.04.14v	Raimund Scheuvers	9:39	9:42f		33	33.14s	34	13.17e	34	13.18e	2070.0	2058.0	4.7sw		6f	l	m	vf	l		
SO232	04.04.14v	Raimund Scheuvers	9:42	10:30	f	33	32.89s	34	13.18e	34	13.21e	2058.0	1999.0	4.8sw		5f	l	g	vf	n		
SO232	04.04.14v	Raimund Scheuvers	10:30	10:34f		33	28.89s	34	13.21e	34	13.20e	1999.0	1990.0	5.2sw		5c	m	g	vf	n		
SO232	04.04.14v	Raimund Scheuvers	10:34	11:27n		33	28.61s	34	13.20e	34	15.42e	1990.0	1859.0	5.1sw		6c	m	g	vf	n		
SO232	04.04.14v	Raimund Scheuvers	11:27	11:41s		33	29.26s	34	15.42e	34	14.72e	1859.0	1942.0	4.1w		6c	m	g	vb	n		
SO232	04.04.14v	Raimund Scheuvers	11:41	12:30	f	33	30.04s	34	14.72e	34	12.38e	1942.0	2133.0	4.5w		6c	m	g	vf	n		
SO232	04.04.14v	Jens Brack	12:30	13:30	f	33	32.96s	34	12.38e	34	10.50e	2133.0	2419.0	4.2sw		4c	m	g	vf	n		
SO232	04.04.14v	Jens Brack	13:30	14:30	f	33	36.85s	34	10.50e	34	8.49e	2419.0	2488.0	4.5w		4c	m	g	vf	n		
SO232	04.04.14v	Jens Brack	14:30	14:37f		33	41.10s	34	8.49e	34	8.25e	2488.0	2498.0	3.9w		4c	m	g	vf	n		
SO232	04.04.14v	Jens Brack	14:37	15:30	f	33	41.10s	34	8.25e	34	6.34e	2498.0	2501.0	4.2w		5c	m	g	wf	l		
SO232	04.04.14v	Jens Brack	15:30	16:25f		33	45.55s	34	6.34e	34	4.36e	2501.0	2559.0	5.3w		5f	l	m	vf	n		

Regulatory/Ship/ reference platform number	Date	Visual Observer's / watch operator's or name(s) PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Depth at start (metres)	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	Depth at end (metres)	Speed of water at end (knots)	Wind direction (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun (visual watch only)	Precipitation	Comments	Flag record
SO232	Some	04.04.14v	Jens Brack	16:25	16:25 f	33	49.62 s	34	4.36 e	33	49.62 s	34	4.36 e	2559.0	5.1 w	5 r	l	p	n	n			
SO232	Some	05.04.14v	Manuel Moser	3:30	4:07 f	33	41.83 s	33	39.14 e	34	44.38 s	33	37.95 e	2280.0	4.8 w	6 f	l	p	n	n			
SO232	Some	05.04.14v	Manuel Moser	4:07	4:14 f	34	44.38 s	33	37.95 e	34	44.78 s	33	37.74 e	2305.0	4.0 sw	8 r	l	p	n	n			
SO232	Some	05.04.14v	Manuel Moser	4:14	4:16 f	34	44.78 s	33	37.74 e	34	44.96 s	33	37.64 e	2329.0	4.0 sw	6 r	l	m	n	n			
SO232	Some	05.04.14v	Manuel Moser	4:16	4:30 f	34	44.94 s	33	37.64 e	34	45.91 s	33	37.09 e	2393.0	4.0 sw	7 r	l	p	n	n			
SO232	Some	05.04.14v	Manuel Moser	4:30	4:38 f	34	45.91 s	33	37.09 e	34	46.71 s	33	36.76 e	2448.0	5.5 sw	8 r	l	m	vb	n			
SO232	Some	05.04.14v	Manuel Moser	4:38	5:28 f	34	46.71 s	33	36.76 e	34	49.98 s	33	35.21 e	2482.0	5.4 sw	6 f	l	m	vb	n			
SO232	Some	05.04.14v	Manuel Moser	5:28	5:55 f	34	49.98 s	33	35.21 e	34	52.15 s	33	34.14 e	2648.0	4.7 sw	7 r	l	m	vb	n			
SO232	Some	05.04.14v	Raimund Scheuvers	5:55	5:59 f	34	52.15 s	33	34.14 e	34	52.42 s	33	34.01 e	2653.0	4.5 sw	7 r	l	m	n	n			
SO232	Some	05.04.14v	Raimund Scheuvers	5:59	6:30 f	34	52.42 s	33	34.01 e	34	54.60 s	33	32.93 e	2875.0	4.7 sw	7 r	l	m	n	n			
SO232	Some	05.04.14v	Manuel Moser	6:30	7:30 f	34	54.60 s	33	32.93 e	34	58.78 s	33	30.88 e	2914.0	4.8 sw	6 r	l	m	n	n			
SO232	Some	05.04.14v	Raimund Scheuvers	7:30	8:30 f	34	58.78 s	33	30.88 e	35	2.97 s	33	28.85 e	2519.0	5.0 sw	7 r	l	g	n	n			
SO232	Some	05.04.14v	Raimund Scheuvers	8:30	9:30 f	35	2.97 s	33	28.85 e	35	6.91 s	33	26.92 e	2839.0	4.8 sw	7 r	l	g	vb	n			
SO232	Some	05.04.14v	Raimund Scheuvers	9:30	10:30 f	35	6.91 s	33	26.92 e	35	10.78 s	33	25.02 e	3025.0	4.5 sw	7 r	l	g	vb	n			
SO232	Some	05.04.14v	Raimund Scheuvers	10:30	11:30 f	35	10.78 s	33	25.02 e	35	14.70 s	33	23.12 e	3279.0	3.5 sw	7 r	l	g	vb	n			
SO232	Some	05.04.14v	Raimund Scheuvers	11:30	12:30 f	35	14.70 s	33	23.12 e	35	18.86 s	33	21.07 e	4038.0	4.1 sw	7 r	l	g	vb	n			
SO232	Some	05.04.14v	Jens Brack	12:30	13:30 f	35	18.86 s	33	21.07 e	35	23.33 s	33	18.50 e	3911.0	4.8 s	6 r	l	g	vf	n			
SO232	Some	05.04.14v	Jens Brack	13:30	14:30 f	35	23.33 s	33	18.90 e	35	27.45 s	33	16.94 e	4027.0	4.5 s	6 r	l	g	vf	n			
SO232	Some	05.04.14v	Jens Brack	14:30	15:00 f	35	27.45 s	33	16.94 e	35	29.93 s	33	15.61 e	3632.0	5.5 sw	6 r	l	g	vf	n			
SO232	Some	05.04.14v	Jens Brack	15:00	15:30 f	35	29.93 s	33	15.61 e	35	32.26 s	33	14.50 e	3363.0	4.8 sw	6 r	l	g	vf	n			
SO232	Some	05.04.14v	Jens Brack	15:30	16:06 f	35	32.26 s	33	14.50 e	35	35.14 s	33	13.10 e	3724.0	5.0 sw	7 r	l	m	n	n			
SO232	Some	05.04.14v	Jens Brack	16:06	16:30 f	35	35.14 s	33	13.10 e	35	36.86 s	33	12.24 e	3772.0	4.8 s	6 r	l	m	n	n			
SO232	Some	05.04.14v	Jens Brack	16:30	16:30 f	35	36.86 s	33	12.24 e	35	36.86 s	33	12.24 e	3772.0	5.0 s	6 r	l	p	n	n			
SO232	Some	06.04.14v	Manuel Moser	3:30	4:16 f	35	19.31 s	33	9.55 e	35	15.84 s	33	10.14 e	3392.0	4.4 s	4 c	m	p	n	n			
SO232	Some	06.04.14v	Manuel Moser	4:16	4:30 f	35	15.84 s	33	10.14 e	35	14.81 s	33	10.32 e	3369.0	4.6 s	4 c	m	g	vf	n			
SO232	Some	06.04.14v	Manuel Moser	4:30	5:30 f	35	14.81 s	33	10.32 e	35	10.40 s	33	11.08 e	2599.0	4.5 s	4 c	m	g	vf	n			
SO232	Some	06.04.14v	Manuel Moser	5:30	6:30 f	35	10.40 s	33	11.08 e	35	5.87 s	33	11.88 e	2441.0	4.8 s	4 c	m	g	vf	n			

A.7.2 MMO efforts

Regulatory/Ship/ reference platform name	Date	VisualObserver's / watch operator's or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Depth at start (metres)	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	Depth at end (metres)	Speed of water of vessel (knots)	Wind direction (Beaufort)	Wind force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	06.04.14	v	Manuel Moser	6:30	7:30	35	5.67 s	35	11.89 e	2441.0	35	1.46 s	33	12.67 e	2449.0	4.4 se			5 c	m	g	vf	n		
SO232	06.04.14	v	Manuel Moser	7:30	8:30	35	1.46 s	35	12.67 e	2449.0	34	56.95 s	33	13.48 e	2669.0	4.5 se			4 c	m	g	vf	n		
SO232	06.04.14	v	Raimund Scheuvs	8:30	9:30	34	56.95 s	34	13.48 e	2969.0	34	52.47 s	33	14.26 e	2703.0	4.6 se			5 c	m	g	vf	n		
SO232	06.04.14	v	Raimund Scheuvs	9:30	10:30	34	52.47 s	34	14.26 e	2703.0	34	48.06 s	33	15.03 e	2670.0	4.3 se			4 c	m	g	vf	n		
SO232	06.04.14	v	Raimund Scheuvs	10:30	10:55	34	48.06 s	34	15.03 e	2670.0	34	46.13 s	33	15.40 e	2368.0	4.8 s			4 c	m	g	vf	n		
SO232	06.04.14	v	Raimund Scheuvs	10:55	11:30	34	46.13 s	34	15.40 e	2368.0	34	44.15 s	33	15.73 e	2324.0	4.0 se			4 c	o	g	vf	n		
SO232	06.04.14	v	Raimund Scheuvs	11:30	11:45	34	44.15 s	34	15.73 e	2324.0	34	43.18 s	33	15.97 e	2323.0	3.7 se			5 c	o	g	vf	n		
SO232	06.04.14	v	Raimund Scheuvs	11:45	12:30	34	43.18 s	34	15.97 e	2323.0	34	40.45 s	33	16.38 e	2324.0	3.7 se			4 c	o	g	vf	n		
SO232	06.04.14	v	Jens Brack	12:30	13:30	34	40.45 s	34	16.38 e	2324.0	34	36.56 s	33	17.02 e	2294.0	3.8 se			4 c	o	g	vf	n		
SO232	06.04.14	v	Jens Brack	13:30	14:30	34	36.56 s	34	17.02 e	2294.0	34	32.16 s	33	17.82 e	2438.0	4.1 se			5 c	o	g	vf	n		
SO232	06.04.14	v	Jens Brack	14:30	14:52	34	32.16 s	34	17.82 e	2438.0	34	30.63 s	33	18.10 e	2456.0	4.7 se			4 c	o	g	vf	n		
SO232	06.04.14	v	Jens Brack	14:52	15:30	34	30.63 s	34	18.10 e	2456.0	34	28.84 s	33	18.42 e	2446.0	3.0 se			4 c	o	g	vf	n		
SO232	06.04.14	v	Jens Brack	15:30	16:10	34	28.84 s	34	18.42 e	2446.0	34	26.82 s	33	18.77 e	2380.0	3.0 se			4 c	o	g	n	n		
SO232	06.04.14	v	Jens Brack	16:10	16:30	34	26.82 s	34	18.77 e	2380.0	34	25.88 s	33	18.92 e	2283.0	3.0 se			5 c	o	m	n	n		
SO232	06.04.14	v	Jens Brack	16:30	16:30	34	25.88 s	34	18.92 e	2283.0	34	25.88 s	33	18.92 e	2283.0	2.7 se			5 c	o	p	n	n		
SO232	07.04.14	v	Manuel Moser	3:30	4:30	34	16.89 s	34	14.67 e	2119.0	34	18.75 s	33	7.27 e	2509.0	8.2 s			3 s	o	p	n	n		
SO232	07.04.14	v	Manuel Moser	4:30	5:30	34	18.75 s	34	7.27 e	2509.0	34	18.70 s	33	7.49 e	2425.0	0.9 se			4 s	o	g	n	n		
SO232	07.04.14	v	Manuel Moser	5:30	6:30	34	18.70 s	34	7.49 e	2426.0	34	18.58 s	33	7.83 e	2073.0	1.2 se			4 s	o	g	vf	n		
SO232	07.04.14	v	Manuel Moser	6:30	7:30	34	18.58 s	34	7.83 e	2073.0	34	18.79 s	33	5.81 e	2562.0	0.3 se			3 s	o	g	wb	n		
SO232	07.04.14	v	Manuel Moser	7:30	8:30	34	18.79 s	34	5.81 e	2562.0	34	18.71 s	33	5.82 e	2563.0	4.7 se			4 s	o	g	vb	n		
SO232	07.04.14	v	Raimund Scheuvs	8:30	9:30	34	18.71 s	34	5.82 e	2563.0	34	18.28 s	33	5.92 e	2122.0	0.2 se			3 s	o	g	vf	n		
SO232	07.04.14	v	Raimund Scheuvs	9:30	10:30	34	18.28 s	34	5.92 e	2122.0	34	18.31 s	33	6.05 e	2133.0	0.2 se			3 s	o	g	vf	n		
SO232	07.04.14	v	Raimund Scheuvs	10:30	11:30	34	18.31 s	34	6.05 e	2133.0	34	20.88 s	33	10.86 e	2203.0	0.4 se			3 s	o	g	vb	n		
SO232	07.04.14	v	Raimund Scheuvs	11:30	12:30	34	20.88 s	34	10.86 e	2203.0	34	22.65 s	33	18.11 e	2187.0	9.5 se			3 s	o	g	vb	n		
SO232	07.04.14	v	Jens Brack	12:30	13:31	34	22.65 s	34	18.11 e	2187.0	34	24.83 s	33	17.98 e	2304.0	4.7 e			3 s	o	g	sf	n		
SO232	07.04.14	v	Jens Brack	13:31	14:30	34	24.83 s	34	17.98 e	2304.0	34	24.26 s	33	17.97 e	1995.0	0.1 e			4 c	o	g	vb	n		

Regulatory reference number	Ship/platform name	Date	Visual observer's / watch operator's name(s) or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source of activity	Start position - north/ - south/ degrees minutes latitude	Start position - east/ - west/ degrees minutes longitude	Start position - north/ - south/ degrees minutes latitude	End position - north/ - south/ degrees minutes latitude	End position - east/ - west/ degrees minutes longitude	End position of water at start (metres)	Depth of water at end position (metres)	Speed of vessel (knots)	Wind direction/ force (Beaufort)	Sea state (Beaufort)	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	07.04.14	v	Jens Brack	14:30	15:30	n	34	24.26s	34	17.97e	1995.0	34	24.23s	33	18.04e	4c	o	g	vf	n	
SO232	Sonne	07.04.14	v	Jens Brack	15:30	16:05	n	34	24.23s	34	18.04e	1995.0	34	24.19s	33	17.98e	4c	o	g	sb	n	
SO232	Sonne	07.04.14	v	Jens Brack	16:05	16:16	n	34	24.19s	34	17.98e	1996.0	34	23.00s	33	18.00e	4c	o	m	n		
SO232	Sonne	07.04.14	v	Jens Brack	16:16	16:30	n	34	23.00s	34	18.00e	2190.0	34	20.89s	33	18.00e	5c	o	p	n		
SO232	Sonne	07.04.14	v	Jens Brack	16:30	16:30	n	34	20.89s	34	18.00e	2091.0	34	20.89s	33	18.00e	5c	o	p	n		
SO232	Sonne	08.04.14	v	Manuel Moser	3:30	4:06	n	34	17.85s	34	17.60s	2287.0	34	17.60s	33	50.73e	5c	o	p	n		
SO232	Sonne	08.04.14	v	Manuel Moser	4:06	4:30	n	34	17.60s	34	17.65s	2344.0	34	17.65s	33	50.68e	4c	o	g	sf	n	
SO232	Sonne	08.04.14	v	Manuel Moser	4:30	5:30	n	34	17.65s	34	17.67s	2251.0	34	17.67s	33	50.81e	4c	o	g	sf	n	
SO232	Sonne	08.04.14	v	Manuel Moser	5:30	6:30	n	34	17.67s	34	17.67s	2164.0	34	26.43s	33	55.64e	4c	o	g	sb	n	
SO232	Sonne	08.04.14	v	Manuel Moser	6:30	7:30	n	34	26.43s	34	35.43s	2494.0	34	35.43s	34	0.67e	5c	o	g	sb	n	
SO232	Sonne	08.04.14	v	Manuel Moser	7:30	8:30	n	34	35.43s	34	0.67e	2445.0	34	44.57s	34	5.72e	5c	o	g	sb	n	
SO232	Sonne	08.04.14	v	Raimund Scheuvers	8:30	9:30	n	34	44.57s	34	5.72e	2978.0	34	54.25s	34	6.70e	5c	o	g	sb	n	
SO232	Sonne	08.04.14	v	Raimund Scheuvers	9:30	10:30	n	34	54.25s	34	6.70e	2840.0	34	55.80s	34	2.18e	4c	o	g	sb	n	
SO232	Sonne	08.04.14	v	Raimund Scheuvers	10:30	11:11	n	34	55.80s	34	2.18e	2915.0	34	49.43s	34	3.44e	4c	o	g	sf	n	
SO232	Sonne	08.04.14	v	Raimund Scheuvers	11:11	11:30	n	34	49.43s	34	3.44e	2775.0	34	51.41s	34	3.95e	4c	o	g	vf	n	
SO232	Sonne	08.04.14	v	Raimund Scheuvers	11:30	12:30	n	34	51.41s	34	3.95e	3006.0	34	51.62s	34	5.22e	5c	o	g	vb	n	
SO232	Sonne	08.04.14	v	Jens Brack	12:30	13:30	n	34	51.62s	34	5.22e	3023.0	34	51.18s	34	5.21e	4c	o	g	vb	n	
SO232	Sonne	08.04.14	v	Jens Brack	13:30	14:30	n	34	51.18s	34	5.21e	2785.0	34	51.06s	34	5.27e	5c	o	g	vb	n	
SO232	Sonne	08.04.14	v	Jens Brack	14:30	15:30	n	34	51.06s	34	5.27e	2756.0	34	51.96s	34	5.17e	4c	o	g	vb	n	
SO232	Sonne	08.04.14	v	Jens Brack	15:30	16:02	n	34	51.96s	34	5.17e	3006.0	34	56.70s	34	2.25e	5c	o	g	vf	n	
SO232	Sonne	08.04.14	v	Jens Brack	16:02	16:15	n	34	56.70s	34	2.25e	2927.0	34	58.52s	34	1.13e	5c	o	m	n		
SO232	Sonne	08.04.14	v	Jens Brack	16:15	16:30	n	34	58.52s	34	1.13e	3015.0	35	0.68s	33	59.80e	5c	o	p	n		
SO232	Sonne	08.04.14	v	Jens Brack	16:30	16:30	n	35	0.68s	35	59.80e	2877.0	35	0.68s	33	59.80e	5c	o	p	n		
SO232	Sonne	09.04.14	v	Manuel Moser	3:38	4:10	n	35	16.62s	35	23.77e	3476.0	35	16.59s	33	23.81e	5c	o	m	n		
SO232	Sonne	09.04.14	v	Manuel Moser	4:10	4:30	n	35	16.59s	35	23.81e	3471.0	35	16.56s	33	23.83e	5c	o	g	vf	n	
SO232	Sonne	09.04.14	v	Manuel Moser	4:30	4:37	n	35	16.56s	35	23.83e	3419.0	35	16.74s	33	23.83e	5c	o	g	vf	n	
SO232	Sonne	09.04.14	v	Manuel Moser	4:37	4:51	n	35	16.74s	35	23.83e	3647.0	35	17.09s	33	21.97e	5c	o	g	vb	n	

A.7.2 MMO efforts

Regulatory reference number	Ship/platform name	Date	Visual observer's / watch operator's name(s) or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source of activity	Start position - north/ - south degrees minutes latitude	Start position - east/ - west degrees minutes longitude	Start position - north/ - south degrees minutes latitude	End position - north/ - south degrees minutes latitude	End position - east/ - west degrees minutes longitude	End position of water at start (metres)	Depth of water at end (metres)	Speed of vessel (knots)	Wind direction/force (Beaufort)	Sea state (Beaufort)	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	09.04.14	v	Manuel Moser	4:51	5:30 n	35 17 09 s	33 21 97 e	35 17 04 s	33 22 12 e	33 22 12 e	3866.0	3872.0	1.6 e		6 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Manuel Moser	5:30	6:30 n	35 17 04 s	33 22 12 e	35 16 85 s	33 22 15 e	33 22 15 e	3872.0	3653.0	0.2 e		5 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Manuel Moser	6:30	7:30 n	35 16 85 s	33 22 15 e	35 16 63 s	33 22 18 e	33 22 18 e	3653.0	3347.0	1.1 e		5 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Raimund Scheuvers	7:30	8:30 n	35 16 63 s	33 22 18 e	35 16 64 s	33 22 15 e	33 22 15 e	3347.0	3352.0	0.4 ne		5 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Raimund Scheuvers	8:30	9:30 n	35 16 64 s	33 22 15 e	35 17 51 s	33 16 15 e	33 16 15 e	3352.0	3666.0	0.1 ne		5 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Raimund Scheuvers	9:30	10:30 n	35 17 51 s	33 16 15 e	35 17 41 s	33 16 14 e	33 16 14 e	3666.0	3573.0	2.9 ne		4 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Raimund Scheuvers	10:30	11:30 n	35 17 41 s	33 16 14 e	35 17 03 s	33 16 08 e	33 16 08 e	3573.0	3174.0	0.6 ne		6 c	m	g	vf	n		
SO232	Sonne	09.04.14	v	Raimund Scheuvers	11:30	12:30 n	35 17 03 s	33 16 08 e	35 17 04 s	33 16 15 e	33 16 15 e	3174.0	3221.0	0.1 ne		6 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Jens Brack	12:30	13:30 n	35 17 04 s	33 16 15 e	35 16 61 s	33 14 33 e	33 14 33 e	3221.0	3201.0	0.3 ne		5 c	o	g	vf	n		
SO232	Sonne	09.04.14	v	Jens Brack	13:30	14:30 n	35 16 61 s	33 14 33 e	35 11 84 s	33 3 99 e	33 3 99 e	3201.0	3182.0	9.4 ne		5 c	o	g	sf	n		
SO232	Sonne	09.04.14	v	Jens Brack	14:30	14:37 n	35 11 84 s	33 3 99 e	35 11 63 s	33 3 96 e	33 3 96 e	3182.0	3066.0	7.4 ne		5 c	o	g	sf	n		
SO232	Sonne	09.04.14	v	Jens Brack	14:37	15:10 n	35 11 63 s	33 3 96 e	35 11 61 s	33 4 10 e	33 4 10 e	3066.0	3079.0	0.7 ne		5 c	o	g	vb	l		
SO232	Sonne	09.04.14	v	Jens Brack	15:10	15:30 n	35 11 61 s	33 4 10 e	35 11 61 s	33 4 09 e	33 4 09 e	3079.0	3065.0	0.6 ne		6 c	o	g	vb	n		
SO232	Sonne	09.04.14	v	Jens Brack	15:30	15:50 n	35 11 61 s	33 4 09 e	35 11 37 s	33 4 10 e	33 4 10 e	3065.0	2849.0	0.3 ne		5 c	o	g	n	n		
SO232	Sonne	09.04.14	v	Manuel Moser	15:50	16:15 n	35 11 37 s	33 4 10 e	35 11 15 s	33 4 09 e	33 4 09 e	2849.0	2669.0	1.0 e		6 c	o	m	n	n		
SO232	Sonne	09.04.14	v	Jens Brack	16:15	16:30 n	35 11 15 s	33 4 09 e	35 11 15 s	33 4 10 e	33 4 10 e	2669.0	2705.0	0.2 e		5 c	o	p	n	n		
SO232	Sonne	09.04.14	v	Jens Brack	16:30	16:30 n	35 11 15 s	33 4 10 e	35 11 15 s	33 4 10 e	33 4 10 e	2705.0	2705.0	0.3 e		5 c	o	p	n	n		
SO232	Sonne	10.04.14	v	Manuel Moser	3:31	3:59 n	35 20 66 s	32 42 56 e	35 20 29 s	32 42 73 e	32 42 73 e	4089.0	3744.0	0.8 ne		5 s	o	p	n	n		
SO232	Sonne	10.04.14	v	Manuel Moser	3:59	4:30 n	35 20 29 s	32 42 79 e	35 20 20 s	32 42 81 e	32 42 81 e	3744.0	3668.0	0.8 n		5 c	o	m	n	n		
SO232	Sonne	10.04.14	v	Manuel Moser	4:30	4:48 n	35 20 20 s	32 42 81 e	35 20 24 s	32 42 76 e	32 42 76 e	3668.0	3730.0	0.7 ne		5 c	o	g	vf	n		
SO232	Sonne	10.04.14	v	Manuel Moser	4:48	5:30 n	35 20 24 s	32 42 76 e	35 20 22 s	32 42 77 e	32 42 77 e	3730.0	3718.0	0.3 ne		5 c	o	g	sf	n		
SO232	Sonne	10.04.14	v	Manuel Moser	5:30	6:30 n	35 20 22 s	32 42 77 e	35 18 69 s	32 40 32 e	32 40 32 e	3718.0	3776.0	0.8 ne		5 c	o	g	sf	n		
SO232	Sonne	10.04.14	v	Manuel Moser	6:30	7:30 n	35 18 69 s	32 40 32 e	35 12 40 s	32 30 70 e	32 30 70 e	3776.0	3321.0	10.1 ne		5 c	o	g	sb	n		
SO232	Sonne	10.04.14	v	Raimund Scheuvers	7:30	8:30 n	35 12 40 s	32 30 70 e	35 6 12 s	32 21 10 e	32 21 10 e	3321.0	3662.0	10.0 ne		5 c	o	g	sb	n		
SO232	Sonne	10.04.14	v	Raimund Scheuvers	8:30	9:30 n	35 6 12 s	32 21 10 e	34 59 32 s	32 11 59 e	32 11 59 e	3662.0	3682.0	9.9 ne		5 c	o	g	sf	n		
SO232	Sonne	10.04.14	v	Raimund Scheuvers	9:30	10:30 n	34 59 32 s	32 11 59 e	34 53 45 s	32 1 77 e	32 1 77 e	3682.0	3736.0	10.0 ne		5 c	o	g	sf	n		
SO232	Sonne	10.04.14	v	Raimund Scheuvers	10:30	11:30 n	34 53 45 s	32 1 77 e	34 45 91 s	31 56 39 e	31 56 39 e	3736.0	3404.0	9.3 ne		5 c	o	g	sf	n		

Regulatory Ship/ reference number	Date	Visual Observer's / watch operator's or name(s) PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - north/ - south degrees minutes latitude	Start position - east/ - west degrees minutes longitude	Start position - north/ - south degrees minutes latitude	Start position - east/ - west degrees minutes longitude	Depth of water at start (metres)	End position - north/ - south degrees minutes latitude	End position - east/ - west degrees minutes longitude	End position - north/ - south degrees minutes latitude	End position - east/ - west degrees minutes longitude	Depth at end (metres)	Speed of vessel (knots)	Wind direction (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	10.04.14	v	11:30	12:30	34	45.91s	31	56.39e	3404.0	34	49.06s	31	56.56e	3937.0	9.3	ne	5c	o	g	sf	n		
SO232	10.04.14	v	12:30	13:30	34	49.06s	31	56.56e	3937.0	34	48.53s	31	56.67e	3805.0	6.4	ne	5c	o	g	vf	n		
SO232	10.04.14	v	13:30	14:30	34	48.53s	31	56.67e	3805.0	34	47.99s	31	56.60e	3428.0	0.4	ne	4c	o	g	vb	n		
SO232	10.04.14	v	14:30	15:30	34	47.99s	31	56.60e	3428.0	34	48.04s	31	56.74e	3422.0	0.5	ne	5c	o	g	vf	n		
SO232	10.04.14	v	15:30	16:05	34	48.04s	31	56.74e	3422.0	34	47.88s	31	56.90e	3510.0	0.7	ne	5c	o	g	n	n		
SO232	10.04.14	v	16:05	16:21	34	47.88s	31	56.90e	3510.0	34	47.87s	31	56.94e	3512.0	0.6	n	5c	o	m	n	n		
SO232	10.04.14	v	16:21	16:30	34	47.87s	31	56.94e	3512.0	34	47.77s	31	57.00e	3661.0	1.7	n	5c	o	p	n	n		
SO232	10.04.14	v	16:30	16:30	34	47.77s	31	57.00e	3661.0	34	47.77s	31	57.00e	3661.0	0.3	n	5c	o	p	n	n		
SO232	11.04.14	v	3:30	3:53	34	29.21s	32	23.78e	2684.0	34	30.70s	32	22.87e	2778.0	4.3	ne	5s	o	p	n	n		
SO232	11.04.14	v	3:53	4:30	34	30.70s	32	22.87e	2778.0	34	33.01s	32	21.64e	2916.0	4.2	ne	5s	o	m	n	n		
SO232	11.04.14	v	4:30	5:30	34	33.01s	32	21.64e	2916.0	34	37.04s	32	19.32e	3044.0	4.4	ne	5s	o	g	sb	n		
SO232	11.04.14	v	5:30	6:30	34	37.04s	32	19.32e	3044.0	34	40.91s	32	17.13e	3284.0	4.6	ne	6c	o	g	sb	n		
SO232	11.04.14	v	6:30	7:30	34	40.91s	32	17.13e	3284.0	34	44.57s	32	15.03e	3096.0	4.0	ne	4c	o	g	sb	n		
SO232	11.04.14	v	7:30	8:30	34	44.57s	32	15.03e	3096.0	34	48.46s	32	12.80e	3453.0	4.3	ne	5c	o	g	sb	n		
SO232	11.04.14	v	8:30	9:30	34	48.46s	32	12.80e	3453.0	34	52.06s	32	10.72e	3446.0	4.1	ne	4c	o	g	sb	n		
SO232	11.04.14	v	9:30	10:30	34	52.06s	32	10.72e	3446.0	34	55.97s	32	8.49e	3540.0	4.0	ne	4c	o	g	sb	n		
SO232	11.04.14	v	10:30	11:30	34	55.97s	32	8.49e	3540.0	34	59.57s	32	6.45e	3974.0	4.1	ne	4c	o	g	sb	n		
SO232	11.04.14	v	11:30	12:30	34	59.57s	32	6.45e	3974.0	35	3.74s	32	4.03e	4080.0	4.0	ne	4c	o	g	sb	n		
SO232	11.04.14	v	12:30	13:30	35	3.74s	32	4.03e	4080.0	35	7.87s	32	1.63e	3974.0	4.7	n	4c	o	g	vf	n		
SO232	11.04.14	v	13:30	14:34	35	7.87s	32	1.63e	3974.0	35	12.76s	31	58.88e	4026.0	4.9	n	4s	o	g	vf	n		
SO232	11.04.14	v	14:34	15:30	35	12.76s	31	58.88e	4026.0	35	16.93s	31	56.44e	4081.0	5.0	n	4s	o	g	vf	n		
SO232	11.04.14	v	15:30	16:00	35	16.93s	31	56.44e	4081.0	35	19.09s	31	55.20e	4125.0	5.1	n	4s	o	g	n	n		
SO232	11.04.14	v	16:00	16:18	35	19.09s	31	55.20e	4125.0	35	20.43s	31	54.38e	4155.0	4.7	n	4s	o	m	n	n		
SO232	11.04.14	v	16:18	16:30	35	20.43s	31	54.38e	4155.0	35	21.29s	31	53.88e	4171.0	4.9	n	4s	o	p	n	n		
SO232	11.04.14	v	16:30	16:30	35	21.29s	31	53.88e	4171.0	35	21.29s	31	53.88e	4171.0	4.9	n	4s	o	p	n	n		
SO232	12.04.14	v	3:30	3:53	35	26.02s	32	13.15e	4093.0	35	25.01s	32	15.52e	4037.0	5.1	n	5s	o	p	n	n		

A.7.2 MMO efforts

Regulatory/Ship/ reference platform name	Date	Visual watch operator's or name(s) PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - north/ - south degrees minutes latitude	Start position - north/ - south degrees minutes longitude	Start position - east/ - west degrees minutes longitude	End position - north/ - south degrees minutes latitude	End position - north/ - south degrees minutes longitude	End position - east/ - west degrees minutes longitude	Depth of water at start (metres)	Depth of water at end (metres)	Speed of vessel position (knots)	Wind direction force (Beaufort)	Sea state (Beaufort)	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	12.04.14 v	Manuel Moser	3:53	4:30 f	35	25.01 s	32	15.52 e	35	23.61 s	4037.0	4037.0	5.4 n	5	5	o	m	n	n		
SO232	12.04.14 v	Manuel Moser	4:30	5:30 f	35	23.61 s	32	18.93 e	35	21.46 s	4091.0	4091.0	4.9 n	5	5	o	g	vf	n		
SO232	12.04.14 v	Manuel Moser	5:30	6:30 f	35	21.46 s	32	24.08 e	35	19.34 s	4327.0	4327.0	4.4 n	5	5	o	g	sf	n		
SO232	12.04.14 v	Manuel Moser	6:30	7:30 f	35	19.34 s	32	29.07 e	35	17.38 s	4262.0	4262.0	4.5 n	5	5	o	g	sf	n		
SO232	12.04.14 v	Raimund Scheuvs	7:30	8:30 f	35	17.38 s	32	33.77 e	35	15.27 s	3436.0	3436.0	4.4 n	5	5	o	g	sf	n		
SO232	12.04.14 v	Raimund Scheuvs	8:30	9:30 f	35	15.27 s	32	38.71 e	35	13.21 s	2928.0	2928.0	4.6 n	5	5	o	g	sf	n		
SO232	12.04.14 v	Raimund Scheuvs	9:30	10:30 f	35	13.21 s	32	43.69 e	35	11.16 s	2807.0	2807.0	4.5 n	4	4	o	g	sf	n		
SO232	12.04.14 v	Raimund Scheuvs	10:30	11:30 f	35	11.16 s	32	48.59 e	35	9.00 s	3164.0	3164.0	4.2 n	4	4	o	g	vf	n		
SO232	12.04.14 v	Raimund Scheuvs	11:30	12:30 f	35	9.00 s	32	53.81 e	35	6.92 s	2552.0	2552.0	4.5 n	4	4	o	g	sf	n		
SO232	12.04.14 v	Jens Brack	12:30	13:30 f	35	6.92 s	32	58.70 e	35	4.98 s	2342.0	2342.0	4.4 n	4	4	o	g	vf	n		
SO232	12.04.14 v	Jens Brack	13:30	14:32 f	35	4.98 s	33	3.30 e	35	2.74 s	3559.0	3559.0	4.6 n	4	4	o	g	vb	n		
SO232	12.04.14 v	Jens Brack	14:32	15:30 f	35	2.74 s	33	8.59 e	35	0.75 s	2550.0	2550.0	4.5 n	4	4	o	g	vb	n		
SO232	12.04.14 v	Jens Brack	15:30	15:56 f	35	0.75 s	33	13.83 e	35	0.75 s	2623.0	2623.0	4.7 n	4	4	o	g	n	n		
SO232	12.04.14 v	Manuel Moser	15:56	16:14 f	34	59.87 s	33	15.36 e	34	59.25 s	2750.0	2750.0	4.4 ne	4	4	o	m	n	n		
SO232	12.04.14 v	Jens Brack	16:14	16:30 f	34	59.25 s	33	16.87 e	34	58.84 s	2772.0	2772.0	4.4 n	4	4	o	p	n	n		
SO232	12.04.14 v	Jens Brack	16:30	16:30 f	34	58.84 s	33	17.87 e	34	58.84 s	2772.0	2772.0	4.5 n	4	4	o	p	n	n		
SO232	13.04.14 v	Manuel Moser	3:30	3:53 f	34	44.58 s	32	21.76 e	34	49.98 s	3277.0	3277.0	4.9 ne	5	5	o	p	n	n		
SO232	13.04.14 v	Manuel Moser	3:53	4:30 f	34	43.98 s	32	19.37 e	34	43.04 s	3277.0	3277.0	5.2 ne	5	5	o	m	n	n		
SO232	13.04.14 v	Manuel Moser	4:30	5:30 f	34	43.04 s	32	15.78 e	34	41.45 s	3336.0	3336.0	5.3 ne	5	5	o	g	sb	n		
SO232	13.04.14 v	Manuel Moser	5:30	6:30 f	34	41.45 s	32	9.59 e	34	39.95 s	3396.0	3396.0	5.3 ne	5	5	o	m	g	sb	n	
SO232	13.04.14 v	Manuel Moser	6:30	7:30 f	34	39.95 s	32	3.53 e	34	38.41 s	3523.0	3523.0	5.0 ne	4	4	o	m	g	sb	n	
SO232	13.04.14 v	Raimund Scheuvs	7:30	8:30 f	34	38.41 s	31	57.56 e	34	36.93 s	3617.0	3617.0	5.3 ne	4	4	o	m	g	sb	n	
SO232	13.04.14 v	Raimund Scheuvs	8:30	9:30 f	34	36.93 s	31	51.71 e	34	35.48 s	3673.0	3673.0	5.0 ne	4	4	o	m	g	sf	n	
SO232	13.04.14 v	Raimund Scheuvs	9:30	10:30 f	34	35.48 s	31	46.11 e	34	34.07 s	3824.0	3824.0	4.9 ne	4	4	o	m	g	sf	n	
SO232	13.04.14 v	Raimund Scheuvs	10:30	11:30 f	34	34.07 s	31	40.45 e	34	32.52 s	4270.0	4270.0	4.8 ne	4	4	o	m	g	sf	n	
SO232	13.04.14 v	Raimund Scheuvs	11:30	12:30 f	34	32.52 s	31	34.58 e	34	31.03 s	4149.0	4149.0	5.3 ne	4	4	o	m	g	sf	n	
SO232	13.04.14 v	Jens Brack	12:30	13:30 f	34	31.03 s	31	28.66 e	34	29.61 s	4129.0	4129.0	5.1 ne	4	4	o	m	g	sf	n	

Regulatory/Ship/ reference platform name	Date	Visual Observer's watch operator's or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Depth of water at start (metres)	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	Speed of vessel at end position (knots)	Wind direction force (Beaufort)	Sea state (Beaufort)	Swell (visual watch only)	Visibility (visual watch only)	Precipitation	Comments	Flag record
SO232	13.04.14 v	Manuel Moser	13:30	13:51 f	34	29.61 s	31	23.25 e	4129.0	34	29.11 s	31	21.28 e	4100.0	4.6 ne	4 c	m	g	sf	n	
SO232	13.04.14 v	Manuel Moser	13:51	14:30 n	34	29.11 s	31	21.28 e	4100.0	34	29.32 s	31	20.01 e	4083.0	4.4 ne	4 c	m	g	sf	n	
SO232	13.04.14 v	Jens Brack	14:30	14:55 n	34	29.32 s	31	20.01 e	4083.0	34	29.57 s	31	21.90 e	4086.0	4.6 ne	5 c	m	g	sb	n	
SO232	13.04.14 v	Jens Brack	14:55	15:10 s	34	29.57 s	31	21.90 e	4086.0	34	29.70 s	31	23.34 e	4115.0	5.2 n	5 c	m	g	sb	n	
SO232	13.04.14 v	Jens Brack	15:10	15:30 f	34	29.70 s	31	23.34 e	4115.0	34	29.89 s	31	25.54 e	4140.0	4.5 ne	5 c	m	m	vb	n	
SO232	13.04.14 v	Jens Brack	15:30	16:30 f	34	29.89 s	31	25.54 e	4140.0	34	30.39 s	31	31.41 e	4278.0	5.1 n	5 c	m	m	n	n	
SO232	13.04.14 v	Manuel Moser	16:30	16:30 f	34	30.39 s	31	31.41 e	4278.0	34	30.39 s	31	31.41 e	4278.0	5.2 n	5 c	m	p	n	n	
SO232	14.04.14 v	Manuel Moser	3:30	3:34 s	34	35.83 s	32	27.28 e	2765.0	34	35.37 s	32	27.08 e	2843.0	5.7 n	7 r	m	p	n	n	
SO232	14.04.14 v	Manuel Moser	3:34	3:57 f	34	35.67 s	32	27.08 e	2843.0	34	34.21 s	32	25.41 e	2846.0	5.7 n	7 r	m	p	n	n	
SO232	14.04.14 v	Manuel Moser	3:57	4:20 f	34	34.21 s	32	25.41 e	2846.0	34	32.87 s	32	23.79 e	2823.0	5.2 n	7 r	m	m	n	n	
SO232	14.04.14 v	Manuel Moser	4:20	4:30 f	34	32.87 s	32	23.79 e	2823.0	34	32.33 s	32	23.17 e	2805.0	4.9 n	7 r	m	g	sb	n	
SO232	14.04.14 v	Manuel Moser	4:30	5:30 f	34	32.33 s	32	23.17 e	2805.0	34	28.44 s	32	18.62 e	2860.0	5.3 n	7 r	m	g	sb	n	
SO232	14.04.14 v	Manuel Moser	5:30	6:30 f	34	28.44 s	32	18.62 e	2860.0	34	24.66 s	32	14.17 e	2799.0	5.5 n	7 r	m	g	sb	n	
SO232	14.04.14 v	Manuel Moser	6:30	7:30 f	34	24.66 s	32	14.17 e	2799.0	34	20.79 s	32	9.60 e	3055.0	5.0 n	7 r	m	g	sb	n	
SO232	14.04.14 v	Manuel Moser	7:30	8:30 f	34	20.79 s	32	9.60 e	3055.0	34	17.11 s	32	5.25 e	3236.0	5.0 n	7 r	m	g	sf	n	
SO232	14.04.14 v	Raimund Scheuvers	8:30	9:30 f	34	17.11 s	32	5.25 e	3236.0	34	13.51 s	32	1.06 e	3418.0	4.8 n	6 r	m	g	vf	n	
SO232	14.04.14 v	Raimund Scheuvers	9:30	10:30 f	34	13.51 s	32	1.06 e	3418.0	34	10.09 s	31	57.03 e	3550.0	5.2 n	6 r	m	g	vf	n	
SO232	14.04.14 v	Raimund Scheuvers	10:30	11:30 f	34	10.09 s	31	57.03 e	3550.0	34	6.80 s	31	53.17 e	3792.0	4.2 n	6 r	m	g	vf	n	
SO232	14.04.14 v	Raimund Scheuvers	11:30	11:46 f	34	6.80 s	31	53.17 e	3792.0	34	5.77 s	31	51.96 e	3947.0	4.4 n	6 r	m	g	vf	n	
SO232	14.04.14 v	Jens Brack	11:46	12:30 r	34	5.77 s	31	51.96 e	3947.0	34	3.49 s	31	49.28 e	4217.0	4.8 n	6 r	m	m	n	n	
SO232	14.04.14 v	Jens Brack	12:30	13:30 r	34	3.49 s	31	49.28 e	4217.0	34	0.23 s	31	45.47 e	4141.0	4.8 n	6 r	m	m	vf	n	
SO232	14.04.14 v	Jens Brack	13:30	14:30 r	34	0.23 s	31	45.47 e	4141.0	33	56.76 s	31	42.42 e	4062.0	5.1 n	6 r	m	m	sf	n	
SO232	14.04.14 v	Jens Brack	14:30	15:30 r	33	56.76 s	31	42.42 e	4062.0	33	53.56 s	31	37.68 e	4000.0	4.9 n	6 r	m	m	n	n	
SO232	14.04.14 v	Jens Brack	15:30	16:15 r	33	53.56 s	31	37.68 e	4000.0	33	50.92 s	31	34.65 e	3937.0	5.1 n	5 s	m	m	n	n	
SO232	14.04.14 v	Manuel Moser	16:15	16:30 n	33	50.92 s	31	34.65 e	3937.0	33	50.65 s	31	33.17 e	3925.0	4.9 n	6 s	m	p	n	n	
SO232	14.04.14 v	Jens Brack	16:30	16:30 n	33	50.65 s	31	33.17 e	3925.0	33	50.65 s	31	33.17 e	3925.0	5.5 n	4 s	m	p	n	n	
SO232	15.04.14 v	Manuel Moser	3:30	3:56 r	33	54.23 s	32	39.52 e	2948.0	33	54.27 s	32	42.13 e	2801.0	5.0 sw	5 c	m	p	n	n	

A.7.2 MMO efforts

Regulatory reference number	Ship/platform name	Date	Visual watch operator's name(s) or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source of activity	Start position - north/degrees latitude	Start position - south/degrees latitude	Start position - east/minutes longitude	Start position - west/minutes longitude	Depth of water at start (metres)	End position - north/degrees latitude	End position - south/degrees latitude	End position - east/minutes longitude	End position - west/minutes longitude	Depth of water at end (metres)	Speed of vessel (knots)	Wind direction/force (Beaufort)	Sea state (Beaufort)	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	15.04.14 v	Manuel Moser	3:56	4:30 r		33	54.27 s	32	42.13 e	2801.0	33	54.40 s	32	45.42 e	2668.0	4.9 sw		5 c	m	m	n	n		
SO232	Sonne	15.04.14 v	Manuel Moser	4:30	5:30 r		33	54.40 s	32	45.42 e	2668.0	33	54.54 s	32	51.25 e	2532.0	4.8 s		6 f	m	m	n	n		
SO232	Sonne	15.04.14 v	Manuel Moser	5:30	6:30 r		33	54.54 s	32	51.25 e	2532.0	33	54.74 s	32	56.93 e	2456.0	4.3 sw		6 f	m	m	wf	n		
SO232	Sonne	15.04.14 v	Manuel Moser	6:30	7:30 r		33	54.74 s	32	56.93 e	2456.0	33	54.89 s	33	2.66 e	2462.0	4.4 s		7 f	m	m	n	l		
SO232	Sonne	15.04.14 v	Raimund Scheuvers	7:30	8:30 r		33	54.89 s	33	2.66 e	2462.0	33	55.05 s	33	8.56 e	2540.0	4.6 s		6 f	m	g	n	n		
SO232	Sonne	15.04.14 v	Raimund Scheuvers	8:30	9:18 r		33	55.05 s	33	8.56 e	2540.0	33	55.18 s	33	13.23 e	2308.0	5.1 s		6 f	m	g	n	n		
SO232	Sonne	15.04.14 v	Raimund Scheuvers	9:18	9:30 r		33	55.18 s	33	13.23 e	2308.0	33	55.21 s	33	14.27 e	2389.0	4.5 s		6 f	m	g	n	l		
SO232	Sonne	15.04.14 v	Raimund Scheuvers	9:30	10:30 r		33	55.20 s	33	14.27 e	2389.0	33	55.38 s	33	19.91 e	2230.0	4.7 s		6 f	m	g	n	n		
SO232	Sonne	15.04.14 v	Raimund Scheuvers	10:30	11:30 r		33	55.38 s	33	19.91 e	2230.0	33	55.48 s	33	25.42 e	2213.0	4.8 s		5 r	m	g	n	n		
SO232	Sonne	15.04.14 v	Raimund Scheuvers	11:30	12:30 r		33	55.48 s	33	25.42 e	2213.0	33	55.66 s	33	31.21 e	2138.0	4.6 s		5 f	m	g	n	n		
SO232	Sonne	15.04.14 v	Raimund Scheuvers	12:30	13:30 r		33	55.66 s	33	31.21 e	2138.0	33	55.88 s	33	36.66 e	2086.0	4.7 s		5 r	m	g	n	n		
SO232	Sonne	15.04.14 v	Jens Brack	13:30	14:30 r		33	55.88 s	33	36.66 e	2086.0	33	55.95 s	33	42.04 e	2131.0	4.9 sw		5 r	m	g	n	n		
SO232	Sonne	15.04.14 v	Jens Brack	14:30	15:30 r		33	55.95 s	33	42.04 e	2131.0	33	56.13 s	33	47.00 e	2554.0	5.3 s		5 f	m	g	n	n		
SO232	Sonne	15.04.14 v	Jens Brack	15:30	15:52 r		33	56.13 s	33	47.00 e	2554.0	33	56.18 s	33	49.14 e	2286.0	5.1 s		6 r	m	m	n	n		
SO232	Sonne	15.04.14 v	Manuel Moser	15:52	16:30 r		33	56.18 s	33	49.14 e	2286.0	33	56.26 s	33	52.26 e	2335.0	4.0 se		5 f	m	p	n	n		
SO232	Sonne	15.04.14 v	Jens Brack	16:30	16:30 r		33	56.26 s	33	52.26 e	2335.0	33	56.26 s	33	52.26 e	2335.0	5.2 s		6 f	m	p	n	n		
SO232	Sonne	16.04.14 v	Manuel Moser	3:30	3:50 r		33	57.98 s	34	52.36 e	2471.0	33	58.02 s	34	54.15 e	2451.0	4.7 s		5 c	m	p	n	n		
SO232	Sonne	16.04.14 v	Manuel Moser	3:50	4:30 r		33	58.02 s	34	54.15 e	2451.0	33	58.08 s	34	57.76 e	2373.0	4.7 s		5 c	m	m	n	n		
SO232	Sonne	16.04.14 v	Manuel Moser	4:30	4:39 r		33	58.08 s	34	57.76 e	2373.0	33	58.14 s	34	58.66 e	2310.0	4.5 s		6 c	l	g	vf	n		
SO232	Sonne	16.04.14 v	Manuel Moser	4:39	4:43 r		33	58.14 s	34	58.66 e	2310.0	33	58.15 s	34	58.96 e	2282.0	4.4 s		6 c	l	m	vf	l		
SO232	Sonne	16.04.14 v	Manuel Moser	4:43	5:30 r		33	58.15 s	34	58.96 e	2282.0	33	58.25 s	35	3.09 e	2290.0	4.4 se		4 c	l	g	wf	n		
SO232	Sonne	16.04.14 v	Manuel Moser	5:30	6:30 r		33	58.25 s	35	3.09 e	2290.0	33	58.39 s	35	8.57 e	2390.0	4.3 se		5 c	l	g	vf	n		
SO232	Sonne	16.04.14 v	Manuel Moser	6:30	7:30 r		33	58.39 s	35	8.57 e	2390.0	33	58.56 s	35	14.17 e	2488.0	4.5 s		6 c	l	g	sf	n		
SO232	Sonne	16.04.14 v	Raimund Scheuvers	7:30	8:12 r		33	58.56 s	35	14.17 e	2488.0	33	58.67 s	35	18.10 e	2438.0	4.8 s		5 c	l	g	vf	n		
SO232	Sonne	16.04.14 v	Raimund Scheuvers	8:12	8:56 r		33	58.67 s	35	15.10 e	2438.0	33	58.78 s	35	22.21 e	2486.0	4.4 s		5 c	l	g	vf	l		
SO232	Sonne	16.04.14 v	Raimund Scheuvers	8:56	9:30 r		33	58.78 s	35	22.21 e	2486.0	33	58.91 s	35	25.45 e	2350.0	4.5 s		7 c	l	g	vb	n		
SO232	Sonne	16.04.14 v	Raimund Scheuvers	9:30	10:30 r		33	58.91 s	35	25.45 e	2350.0	33	59.03 s	35	30.73 e	2329.0	4.6 s		5 c	m	g	vb	n		

Regulatory/Ship/ reference platform name	Date	Visual Observer's/ watch operator's name(s) or PAM?	Time of Source start of activity start of watch (UTC)	Time of end of activity end of watch (UTC)	Start position degrees minutes seconds latitude	Start position degrees minutes seconds longitude	Start position degrees minutes seconds east/ west	Depth at water position (metres)	End position degrees minutes seconds latitude	End position degrees minutes seconds longitude	End position degrees minutes seconds east/ west	Depth at water position (metres)	Speed of vessel (knots)	Wind direction (Beaufort)	Sea state (Beaufort)	Swell state (visual only)	Visibility (visual only)	Sun glare watch only	Precipitation	Comments	Flag record
SO232	16.04.14v	Raimund Scheuvers	10:30	11:30	33	59.03s	35	30.73e	33	59.16s	35	35.73e	2274.0	4.1s	5c	m	g	vb	n		
SO232	16.04.14v	Raimund Scheuvers	11:30	12:30	33	59.16s	35	35.73e	33	59.28s	35	40.73e	2279.0	4.1se	4s	m	g	vb	n		
SO232	16.04.14v	Jens Brack	12:30	13:30	35	59.28s	35	40.73e	33	59.47s	35	46.11e	2261.0	4.1s	4c	m	g	vb	n		
SO232	16.04.14v	Jens Brack	13:30	14:30	33	59.47s	35	46.11e	33	59.64s	35	51.74e	2307.0	4.6s	6c	m	g	vb	n		
SO232	16.04.14v	Jens Brack	14:30	15:30	33	59.64s	35	51.74e	33	59.78s	35	56.70e	2518.0	4.4s	5s	m	g	sb	n		
SO232	16.04.14v	Jens Brack	15:30	15:42	33	59.78s	35	56.70e	33	59.80s	35	57.80e	2600.0	4.7s	5s	o	m	vb	n		
SO232	16.04.14v	Jens Brack	15:42	15:53	33	59.80s	35	57.80e	33	59.82s	35	58.73e	2695.0	4.0s	5s	o	p	n	n		
SO232	16.04.14v	Manuel Moser	15:53	15:57	33	59.82s	35	58.73e	33	59.84s	35	58.09e	2693.0	4.1se	5s	o	p	n	l		
SO232	16.04.14v	Manuel Moser	15:57	16:05	33	59.84s	35	58.09e	33	59.87s	35	59.65e	2719.0	4.1s	4s	o	p	n	n		
SO232	17.04.14v	Manuel Moser	3:30	3:45	34	4.49s	36	13.62e	34	4.59s	36	13.55e	3739.0	0.2se	5s	o	p	n	n		
SO232	17.04.14v	Manuel Moser	3:45	4:30	34	4.59s	36	13.55e	34	4.81s	36	13.35e	3391.0	1.0se	5s	o	m	n	n		
SO232	17.04.14v	Manuel Moser	4:30	5:30	34	4.81s	36	13.35e	34	4.79s	36	13.34e	3396.0	0.4se	5s	o	g	vf	n		
SO232	17.04.14v	Manuel Moser	5:30	6:30	34	4.79s	36	13.34e	34	4.80s	36	13.42e	3396.0	0.1se	4c	m	g	sf	n	no EM 120 depth	
SO232	17.04.14v	Manuel Moser	6:30	7:30	34	4.80s	36	13.42e	34	2.85s	36	14.24e	4180.0	4.5se	5c	m	g	sf	n		
SO232	17.04.14v	Manuel Moser	7:30	8:30	34	2.85s	36	14.24e	34	2.93s	36	14.18e	4180.0	0.2se	4c	m	g	sb	n		
SO232	17.04.14v	Raimund Scheuvers	8:30	9:30	34	2.93s	36	14.18e	34	3.10s	36	13.95e	3857.0	1.0s	4c	o	g	vb	n		
SO232	17.04.14v	Raimund Scheuvers	9:30	9:37	34	3.10s	36	13.95e	34	3.09s	36	13.93e	3914.0	0.1se	5c	o	g	vb	n		
SO232	17.04.14v	Raimund Scheuvers	9:37	9:45	34	3.09s	36	13.93e	34	3.10s	36	13.93e	4058.0	0.2se	4s	o	g	vb	l		
SO232	17.04.14v	Jens Brack	9:45	10:30	34	3.10s	36	13.93e	34	3.07s	36	13.94e	3842.0	0.1se	4s	o	g	vb	n		
SO232	17.04.14v	Raimund Scheuvers	10:30	11:30	34	3.07s	36	13.94e	34	2.58s	36	14.75e	4424.0	0.2se	4c	o	g	vb	n		
SO232	17.04.14v	Raimund Scheuvers	11:30	12:35	34	2.58s	36	14.75e	34	55.08s	36	18.72e	4640.0	8.6se	5c	o	g	vf	n		
SO232	17.04.14v	Jens Brack	12:35	13:30	33	55.08s	36	18.72e	33	57.80s	36	17.50e	4739.0	4.7se	4s	o	g	vf	n		
SO232	17.04.14v	Jens Brack	13:30	14:30	33	57.80s	36	17.50e	33	57.88s	36	17.42e	4739.0	0.1se	4s	o	g	vb	n		
SO232	17.04.14v	Jens Brack	14:30	15:30	33	57.88s	36	17.42e	33	56.12s	36	17.18e	4419.0	0.4se	4s	o	g	vb	n		
SO232	17.04.14v	Jens Brack	15:30	16:04	33	56.12s	36	17.18e	33	58.10s	36	17.11e	4378.0	0.2se	5s	o	m	vb	n		
SO232	17.04.14v	Manuel Moser	16:04	16:04	33	58.10s	36	17.11e	33	58.10s	36	17.11e	4378.0	0.5se	5s	o	p	n	n		

Regulatory/Ship/ reference platform name	Date	Visual watch operator's or PAM?	Observer's / name(s)	Time of start of section of watch (UTC)	Time of end of activity section of watch (UTC)	Start position - north/ degrees minutes latitude	Start position - north/ degrees minutes south latitude	Start position - longitude degrees minutes east/ longitude	Start position - longitude degrees minutes west	Start position - longitude degrees minutes east/ longitude	Depth at start (metres)	End position - north/ degrees minutes south latitude	End position - north/ degrees minutes south latitude	End position - east/ longitude	End position - east/ longitude	Depth of water of position (metres)	Speed of vessel (knots)	Wind direction (Beaufort)	Sea state (Beaufort)	Swell/Visibility glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Some	19.04.14 v	Jens Brack	14:30	15:30 n	32	47.83 s	36	30.96 e	36	3573.0	32	35.39 s	36	32.24 e	3607.0	9.5 se	2 s	o	g	vf	n	
SO232	Some	19.04.14 v	Jens Brack	15:30	15:58 n	32	39.38 s	36	32.24 e	36	3607.0	32	36.68 s	36	32.70 e	3978.0	10.0 se	2 s	o	m	n	n	
SO232	Some	19.04.14 v	Jens Brack	15:58	15:58 n	32	38.68 s	36	32.70 e	36	3978.0	32	35.69 s	36	32.70 e	3978.0	9.1 sw	1 s	o	p	n	n	
SO232	Some	20.04.14 v	Manuel Moser	3:30	4:30 n	32	30.23 s	36	35.40 e	36	4165.0	32	33.56 s	36	34.84 e	4346.0	6.8 n	2 s	o	m	n	n	
SO232	Some	20.04.14 v	Manuel Moser	4:30	5:30 n	32	33.56 s	36	34.84 e	36	4346.0	32	33.52 s	36	34.78 e	4179.0	0.2 nw	3 s	o	g	sb	n	
SO232	Some	20.04.14 v	Manuel Moser	5:30	6:30 n	32	33.52 s	36	34.78 e	36	4179.0	32	33.86 s	36	34.24 e	3762.0	1.3 nw	2 s	o	g	sb	n	
SO232	Some	20.04.14 v	Manuel Moser	6:30	7:30 n	32	33.86 s	36	34.24 e	36	3762.0	32	33.99 s	36	34.37 e	3903.0	0.2 n	2 s	o	g	sb	n	
SO232	Some	20.04.14 v	Raimund Scheuvers	7:30	8:30 n	32	33.99 s	36	34.37 e	36	3903.0	32	33.91 s	36	34.51 e	3945.0	0.2 n	2 s	o	g	sb	n	
SO232	Some	20.04.14 v	Raimund Scheuvers	8:30	9:30 n	32	33.91 s	36	34.51 e	36	3945.0	32	35.73 s	36	35.61 e	4688.0	0.2 n	3 s	o	g	sf	n	
SO232	Some	20.04.14 v	Raimund Scheuvers	9:30	10:30 n	32	35.73 s	36	35.61 e	36	4688.0	32	35.73 s	36	35.63 e	4672.0	0.1 n	3 s	o	g	sf	n	
SO232	Some	20.04.14 v	Raimund Scheuvers	10:30	11:30 n	32	35.73 s	36	35.63 e	36	4672.0	32	35.49 s	36	35.16 e	4216.0	0.1 n	3 s	o	g	sf	n	
SO232	Some	20.04.14 v	Raimund Scheuvers	11:30	12:30 n	32	35.49 s	36	35.16 e	36	4216.0	32	35.39 s	36	35.21 e	4229.0	0.2 n	3 s	o	g	sf	n	
SO232	Some	20.04.14 v	Jens Brack	12:30	13:30 n	32	35.39 s	36	35.21 e	36	4229.0	32	35.17 s	36	35.01 e	4259.0	0.3 n	4 s	o	g	sf	n	
SO232	Some	20.04.14 v	Jens Brack	13:30	14:30 n	32	35.17 s	36	35.01 e	36	4259.0	32	35.19 s	36	35.19 e	4295.0	0.2 nw	3 s	o	g	vf	n	
SO232	Some	20.04.14 v	Raimund Scheuvers	14:30	15:30 n	32	35.19 s	36	35.19 e	36	4295.0	32	28.61 s	36	36.36 e	4391.0	0.1 nw	4 s	o	g	vb	n	
SO232	Some	20.04.14 v	Jens Brack	15:30	15:47 n	32	28.61 s	36	36.36 e	36	4391.0	32	25.64 s	36	36.18 e	3940.0	9.9 nw	3 s	o	m	n	n	
SO232	Some	20.04.14 v	Jens Brack	15:47	15:47 n	32	25.64 s	36	36.18 e	36	3940.0	32	25.64 s	36	36.18 e	3940.0	9.9 nw	3 s	o	p	n	n	
SO232	Some	21.04.14 v	Manuel Moser	3:30	3:42 f	32	42.31 s	36	12.52 e	36	2293.0	32	43.11 s	36	11.69 e	2291.0	5.1 sw	3 s	o	p	n	n	
SO232	Some	21.04.14 v	Manuel Moser	3:42	4:30 f	32	43.11 s	36	11.69 e	36	2291.0	32	46.08 s	36	8.57 e	2170.0	5.0 sw	2 s	o	m	n	n	
SO232	Some	21.04.14 v	Manuel Moser	4:30	5:30 f	32	46.08 s	36	8.57 e	36	2170.0	32	48.71 s	36	4.79 e	2013.0	4.8 s	3 s	o	g	vb	n	
SO232	Some	21.04.14 v	Manuel Moser	5:30	6:30 f	32	49.71 s	36	4.79 e	36	2013.0	32	53.26 s	36	1.03 e	1951.0	4.8 s	2 s	o	g	sb	n	
SO232	Some	21.04.14 v	Manuel Moser	6:30	7:30 f	32	53.26 s	36	1.03 e	36	1951.0	32	56.77 s	36	57.36 e	1955.0	4.7 s	3 s	o	g	sb	n	
SO232	Some	21.04.14 v	Raimund Scheuvers	7:30	8:30 f	32	56.77 s	36	57.36 e	36	1955.0	33	0.26 s	35	53.73 e	1830.0	4.5 s	3 s	o	g	vb	n	
SO232	Some	21.04.14 v	Raimund Scheuvers	8:30	9:30 f	33	0.26 s	35	53.73 e	35	1830.0	33	3.77 s	35	50.03 e	1785.0	4.8 sw	2 s	o	g	sb	n	
SO232	Some	21.04.14 v	Raimund Scheuvers	9:30	10:30 f	33	3.77 s	35	50.03 e	35	1785.0	33	7.27 s	35	46.42 e	1694.0	4.6 s	2 s	o	g	sb	n	
SO232	Some	21.04.14 v	Raimund Scheuvers	10:30	11:30 f	33	7.27 s	35	46.42 e	35	1694.0	33	10.71 s	35	42.75 e	1657.0	4.3 s	2 s	o	g	sb	n	
SO232	Some	21.04.14 v	Raimund Scheuvers	11:30	12:30 f	33	10.71 s	35	42.75 e	35	1657.0	33	14.59 s	35	38.69 e	1667.0	4.9 se	4 s	o	g	sf	n	

A.7.2 MMO efforts

Regulatory/Ship/ reference number	Date	Visual Observer's / watch operator's or PAM?	Time of end of section of watch (UTC)	Start position - north/ - south degrees minutes latitude	Start position - north/ - south degrees minutes longitude	Start position - east/ - west degrees minutes longitude	Depth of water at start (metres)	End position - north/ - south degrees minutes latitude	End position - north/ - south degrees minutes longitude	End position - east/ - west degrees minutes longitude	Depth of water at end position (metres)	Speed of vessel (knots)	Wind direction force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Some	21.04.14 v	Jens Brack	12:30	13:30 f	35	14.58 s	35	38.09 e	35	18.02 s	35	35.02 e	4 s	o	g	vf	n		
SO232	Some	21.04.14 v	Jens Brack	13:30	14:30 f	35	18.02 s	35	35.02 e	35	18.02 s	35	31.28 e	4 s	o	g	vf	n		
SO232	Some	21.04.14 v	Jens Brack	14:30	15:30 f	35	21.57 s	35	31.28 e	35	25.40 s	35	27.26 e	2 s	o	g	vf	n		
SO232	Some	21.04.14 v	Jens Brack	15:30	15:51 f	35	25.40 s	35	27.26 e	35	28.76 s	35	25.85 e	2 s	o	m	n	n		
SO232	Some	21.04.14 v	Jens Brack	15:51	15:51 f	35	28.75 s	35	25.85 e	35	28.79 s	35	25.85 e	3 s	o	p	n	n		
SO232	Some	22.04.14 v	Manuel Moser	3:31	3:35 s	34	2.84 s	34	47.25 e	34	2.70 s	34	46.98 e	5 s	o	p	n	l		
SO232	Some	22.04.14 v	Manuel Moser	3:35	4:02 f	34	2.70 s	34	46.98 e	34	1.23 s	34	44.65 e	5 s	o	p	n	l		
SO232	Some	22.04.14 v	Manuel Moser	4:02	4:16 f	34	1.23 s	34	44.65 e	34	0.42 s	34	43.40 e	5 s	o	m	n	l		
SO232	Some	22.04.14 v	Manuel Moser	4:16	4:27 f	34	0.42 s	34	43.40 e	34	59.76 s	34	42.37 e	4 s	o	m	wb	n		
SO232	Some	22.04.14 v	Manuel Moser	4:27	5:15 f	33	59.76 s	33	42.37 e	33	57.13 s	33	38.24 e	4 c	o	m	n	m		
SO232	Some	22.04.14 v	Manuel Moser	5:15	5:23 f	33	57.13 s	33	38.24 e	33	56.65 s	33	37.50 e	4 c	o	p	n	h		
SO232	Some	22.04.14 v	Manuel Moser	5:23	5:30 f	33	56.65 s	33	37.50 e	33	56.29 s	33	36.97 e	4 c	o	m	n	m		
SO232	Some	22.04.14 v	Manuel Moser	5:30	5:46 f	33	56.29 s	33	36.97 e	33	55.34 s	33	35.43 e	4 c	o	m	n	l		
SO232	Some	22.04.14 v	Manuel Moser	5:46	5:52 f	33	55.34 s	33	35.43 e	33	55.04 s	33	34.99 e	5 c	o	p	n	h		
SO232	Some	22.04.14 v	Manuel Moser	5:52	6:17 f	33	55.04 s	33	34.99 e	33	53.64 s	33	32.77 e	5 c	o	m	n	l		
SO232	Some	22.04.14 v	Manuel Moser	6:17	6:30 f	33	53.64 s	33	32.77 e	33	52.99 s	33	31.75 e	5 c	o	m	n	m		
SO232	Some	22.04.14 v	Manuel Moser	6:30	7:12 f	33	52.99 s	33	31.75 e	33	50.75 s	33	28.24 e	4 c	o	m	n	n		
SO232	Some	22.04.14 v	Manuel Moser	7:12	7:32 f	33	50.75 s	33	28.24 e	33	49.66 s	33	26.54 e	5 c	o	m	n	m		
SO232	Some	22.04.14 v	Raimund Scheuvers	7:32	7:54 f	33	49.66 s	33	26.54 e	33	48.50 s	33	24.74 e	4 c	o	g	n	n		
SO232	Some	22.04.14 v	Raimund Scheuvers	7:54	8:30 f	33	48.50 s	33	24.74 e	33	46.61 s	33	21.79 e	3 s	o	m	n	m		
SO232	Some	22.04.14 v	Raimund Scheuvers	8:30	9:16 f	33	46.61 s	33	21.79 e	33	44.24 s	33	18.06 e	4 c	o	m	n	m		
SO232	Some	22.04.14 v	Raimund Scheuvers	9:16	9:30 f	33	44.24 s	33	18.06 e	33	43.50 s	33	16.92 e	6 c	o	g	n	n		
SO232	Some	22.04.14 v	Raimund Scheuvers	9:30	10:30 f	33	43.50 s	33	16.92 e	33	40.27 s	33	11.86 e	5 c	o	g	n	n		
SO232	Some	22.04.14 v	Raimund Scheuvers	10:30	11:30 f	33	40.27 s	33	11.86 e	33	37.32 s	33	7.23 e	4 c	o	g	n	n		
SO232	Some	22.04.14 v	Raimund Scheuvers	11:30	12:30 f	33	37.32 s	33	7.23 e	33	34.42 s	33	2.69 e	4 c	o	g	sf	n		
SO232	Some	22.04.14 v	Jens Brack	12:30	13:30 f	33	34.42 s	33	2.69 e	33	32.60 s	33	57.44 e	5 c	o	g	sf	n		

Regulatory reference number	Ship/platform name	Date	Visual observer's / watch operator's or name(s) PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source	Start position - north/latitude	Start position - south/longitude	Start position - east/minutes	Start position - west/longitude	Depth of water at start (metres)	End position - north/latitude	End position - south/longitude	End position - east/minutes	End position - west/longitude	Depth of water at end (metres)	Speed of vessel (knots)	Wind direction	Wind force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	22.04.14 v	Jens Brack	13:30	14:30 f		33 32.60 s	33 57.44 e	33 57.44 e	33 57.44 e	2806.0	33 30.88 s	33 51.72 e	33 51.72 e	33 51.72 e	2519.0	4.9 n		4 s	o	g	sf	n			
SO232	Sonne	22.04.14 v	Jens Brack	14:30	15:30 f		33 30.88 s	33 51.72 e	33 51.72 e	33 51.72 e	2519.0	33 29.10 s	33 45.91 e	33 45.91 e	33 45.91 e	2442.0	5.0 n		4 s	o	g	wf	n			
SO232	Sonne	22.04.14 v	Jens Brack	15:30	15:47 f		33 29.10 s	33 45.91 e	33 45.91 e	33 45.91 e	2442.0	33 28.67 s	33 44.47 e	33 44.47 e	33 44.47 e	2408.0	5.1 n		4 s	o	m	n				
SO232	Sonne	22.04.14 v	Jens Brack	15:47	15:47 f		33 28.67 s	33 44.47 e	33 44.47 e	33 44.47 e	2408.0	33 28.67 s	33 44.47 e	33 44.47 e	33 44.47 e	2408.0	5.0 n		3 s	o	p	n				
SO232	Sonne	23.04.14 v	Manuel Moser	3:31	4:10 f		33 12.46 s	32 59.16 e	32 59.16 e	32 59.16 e	3449.0	33 12.14 s	33 3.16 e	33 3.16 e	33 3.16 e	3697.0	5.2 se		2 s	o	p	n				
SO232	Sonne	23.04.14 v	Manuel Moser	4:10	4:30 f		33 12.14 s	33 3.16 e	33 3.16 e	33 3.16 e	3697.0	33 11.99 s	33 5.00 e	33 5.00 e	33 5.00 e	3708.0	5.0 e		4 s	o	m	n				
SO232	Sonne	23.04.14 v	Manuel Moser	4:30	4:55 f		33 11.99 s	33 5.00 e	33 5.00 e	33 5.00 e	3708.0	33 11.86 s	33 7.33 e	33 7.33 e	33 7.33 e	3734.0	4.7 s		5 s	o	m	n				
SO232	Sonne	23.04.14 v	Manuel Moser	4:55	5:17 f		33 11.86 s	33 7.33 e	33 7.33 e	33 7.33 e	3734.0	33 11.69 s	33 9.30 e	33 9.30 e	33 9.30 e	3755.0	4.6 s		4 s	o	m	n				
SO232	Sonne	23.04.14 v	Manuel Moser	5:17	5:30 f		33 11.69 s	33 9.30 e	33 9.30 e	33 9.30 e	3755.0	33 11.59 s	33 10.45 e	33 10.45 e	33 10.45 e	3751.0	4.6 se		4 s	o	m	n				
SO232	Sonne	23.04.14 v	Manuel Moser	5:30	6:06 f		33 11.59 s	33 10.45 e	33 10.45 e	33 10.45 e	3751.0	33 11.33 s	33 13.95 e	33 13.95 e	33 13.95 e	3141.0	4.7 se		3 s	o	m	n				
SO232	Sonne	23.04.14 v	Manuel Moser	6:06	6:30 f		33 11.33 s	33 13.95 e	33 13.95 e	33 13.95 e	3141.0	33 11.15 s	33 15.96 e	33 15.96 e	33 15.96 e	2784.0	4.6 e		3 s	o	m	n				
SO232	Sonne	23.04.14 v	Manuel Moser	6:30	7:30 f		33 11.15 s	33 15.96 e	33 15.96 e	33 15.96 e	2784.0	33 10.81 s	33 20.57 e	33 20.57 e	33 20.57 e	2776.0	4.5 e		3 s	o	m	n				
SO232	Sonne	23.04.14 v	Raimund Scheuvers	7:30	8:30 f		33 10.81 s	33 20.57 e	33 20.57 e	33 20.57 e	2776.0	33 10.43 s	33 25.79 e	33 25.79 e	33 25.79 e	2606.0	3.2 e		3 s	o	m	n				
SO232	Sonne	23.04.14 v	Raimund Scheuvers	8:30	9:30 f		33 10.43 s	33 25.79 e	33 25.79 e	33 25.79 e	2606.0	33 10.01 s	33 31.22 e	33 31.22 e	33 31.22 e	2523.0	4.5 ne		2 s	o	g	n				
SO232	Sonne	23.04.14 v	Raimund Scheuvers	9:30	10:30 f		33 10.01 s	33 31.22 e	33 31.22 e	33 31.22 e	2523.0	33 9.64 s	33 36.62 e	33 36.62 e	33 36.62 e	2391.0	4.4 se		3 s	o	g	n				
SO232	Sonne	23.04.14 v	Raimund Scheuvers	10:30	11:30 f		33 9.64 s	33 36.62 e	33 36.62 e	33 36.62 e	2391.0	33 9.18 s	33 42.26 e	33 42.26 e	33 42.26 e	3250.0	4.7 se		2 s	o	g	n				
SO232	Sonne	23.04.14 v	Raimund Scheuvers	11:30	12:30 f		33 9.18 s	33 42.26 e	33 42.26 e	33 42.26 e	3250.0	33 8.62 s	33 47.19 e	33 47.19 e	33 47.19 e	2942.0	4.3 sw		3 s	o	m	n				
SO232	Sonne	23.04.14 v	Jens Brack	12:30	12:55 f		33 8.62 s	33 47.19 e	33 47.19 e	33 47.19 e	2942.0	33 8.58 s	33 50.80 e	33 50.80 e	33 50.80 e	2973.0	4.6 sw		3 s	o	m	n				
SO232	Sonne	23.04.14 v	Jens Brack	12:55	13:30 f		33 8.58 s	33 50.80 e	33 50.80 e	33 50.80 e	2973.0	33 8.37 s	33 50.14 e	33 50.14 e	33 50.14 e	2462.0	4.7 s		4 c	m	p	n				
SO232	Sonne	23.04.14 v	Jens Brack	13:30	14:30 f		33 8.37 s	33 50.14 e	33 50.14 e	33 50.14 e	2462.0	33 7.92 s	33 58.22 e	33 58.22 e	33 58.22 e	2235.0	4.4 se		6 c	m	m	n				
SO232	Sonne	23.04.14 v	Jens Brack	14:30	14:42 f		33 7.92 s	33 58.22 e	33 58.22 e	33 58.22 e	2235.0	33 7.86 s	33 59.56 e	33 59.56 e	33 59.56 e	2285.0	4.2 se		7 c	m	m	n				
SO232	Sonne	23.04.14 v	Jens Brack	14:42	15:30 f		33 7.86 s	33 59.56 e	33 59.56 e	33 59.56 e	2265.0	33 7.58 s	34 3.98 e	34 3.98 e	34 3.98 e	2345.0	4.4 se		7 c	m	m	sb	n			
SO232	Sonne	23.04.14 v	Jens Brack	15:30	15:45 f		33 7.58 s	34 3.98 e	34 3.98 e	34 3.98 e	2345.0	33 7.45 s	34 4.99 e	34 4.99 e	34 4.99 e	2322.0	5.1 se		6 c	m	m	n				
SO232	Sonne	23.04.14 v	Jens Brack	15:45	15:45 f		33 7.45 s	34 4.98 e	34 4.98 e	34 4.98 e	2322.0	33 7.45 s	34 4.99 e	34 4.99 e	34 4.99 e	2322.0	4.8 se		7 c	m	p	n				
SO232	Sonne	24.04.14 v	Manuel Moser	3:33	4:00 f		33 14.59 s	35 7.41 e	35 7.41 e	35 7.41 e	1374.0	33 14.89 s	35 9.42 e	35 9.42 e	35 9.42 e	1414.0	4.2 e		7 r	m	p	n				
SO232	Sonne	24.04.14 v	Manuel Moser	4:00	4:30 f		33 14.59 s	35 7.41 e	35 7.41 e	35 7.41 e	1374.0	33 14.89 s	35 11.67 e	35 11.67 e	35 11.67 e	1533.0	3.8 se		7 r	m	m	n				
SO232	Sonne	24.04.14 v	Manuel Moser	4:30	5:30 f		33 15.22 s	35 11.67 e	35 11.67 e	35 11.67 e	1533.0	33 15.94 s	35 16.32 e	35 16.32 e	35 16.32 e	1596.0	3.8 se		7 r	l	m	n				

A.7.2 MMO efforts

Regulatory Ship/ reference platform name	Date	Visual Observer's / watch operator's name(s) or PAM?	Time of start of section of watch (UTC)	Time of end of activity section (UTC)	Start position - north/ degrees minutes latitude	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Start position - east/ degrees minutes longitude	Depth at start (metres)	End position - north/ degrees minutes latitude	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	End position - east/ degrees minutes longitude	Depth of water of at end position (metres)	Speed of vessel (knots)	Wind direction force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	24.04.14 v	Manuel Moser	5:30	6:30 f	33	15.84 s	35	16.32 e	1596.0	33	16.66 s	35	20.92 e	1527.0	3.6 se	7 r	1	g	vf	n			
SO232	24.04.14 v	Manuel Moser	6:30	7:30 f	33	16.66 s	35	20.92 e	1527.0	33	17.40 s	35	25.76 e	1515.0	4.1 se	7 r	1	g	vf	n			
SO232	24.04.14 v	Raimund Scheuvers	7:30	8:30 f	33	17.40 s	35	25.76 e	1515.0	33	18.14 s	35	30.77 e	1626.0	4.3 se	7 r	1	g	n	n			
SO232	24.04.14 v	Raimund Scheuvers	8:30	8:47 f	33	18.14 s	35	30.77 e	1626.0	33	18.35 s	35	32.21 e	1649.0	4.4 se	7 r	1	g	n	n			
SO232	24.04.14 v	Raimund Scheuvers	8:47	9:08 f	33	18.35 s	35	32.21 e	1649.0	33	18.66 s	35	34.12 e	1688.0	4.3 e	7 r	1	m	n	n			
SO232	24.04.14 v	Raimund Scheuvers	9:08	9:30 f	33	18.66 s	35	34.12 e	1688.0	33	18.95 s	35	35.92 e	1719.0	4.6 e	7 r	1	g	n	n			
SO232	24.04.14 v	Raimund Scheuvers	9:30	9:53 f	33	18.95 s	35	35.92 e	1719.0	33	19.24 s	35	37.95 e	1756.0	4.5 e	7 r	1	g	n	n			
SO232	24.04.14 v	Jens Brack	9:53	10:30 f	33	19.24 s	35	37.95 e	1756.0	33	19.69 s	35	40.97 e	1857.0	4.4 e	6 r	1	m	n	n			
SO232	24.04.14 v	Raimund Scheuvers	10:30	11:30 f	33	19.69 s	35	40.97 e	1857.0	33	20.49 s	35	46.39 e	1940.0	4.6 e	6 r	1	m	n	n			
SO232	24.04.14 v	Raimund Scheuvers	11:30	11:49 f	33	20.49 s	35	46.29 e	1940.0	33	20.90 s	35	49.06 e	1983.0	4.6 e	6 r	1	m	n	n			
SO232	24.04.14 v	Jens Brack	11:49	12:30 f	33	20.90 s	35	49.06 e	1983.0	33	21.51 s	35	53.05 e	2027.0	4.7 e	6 r	1	g	n	n			
SO232	24.04.14 v	Jens Brack	12:30	13:04 f	33	21.51 s	35	53.05 e	2027.0	33	21.89 s	35	55.53 e	2142.0	5.4 e	5 r	1	g	n	n			
SO232	24.04.14 v	Jens Brack	13:04	13:30 r	33	21.89 s	35	55.53 e	2142.0	33	22.28 s	35	58.01 e	2915.0	4.9 e	5 r	1	g	n	n			
SO232	24.04.14 v	Jens Brack	13:30	14:30 r	33	22.28 s	35	58.01 e	2415.0	33	23.14 s	35	4.14 e	2438.0	5.2 e	5 r	1	g	n	n			
SO232	24.04.14 v	Jens Brack	14:30	15:30 r	33	23.14 s	36	1.14 e	2438.0	33	24.14 s	36	10.42 e	2510.0	5.8 e	5 r	1	g	sb	n			
SO232	24.04.14 v	Jens Brack	15:30	15:45 f	33	24.14 s	36	10.42 e	2510.0	33	24.40 s	36	12.13 e	2567.0	5.4 ne	5 r	1	p	n	n			
SO232	24.04.14 v	Jens Brack	15:45	15:45 f	33	24.40 s	36	12.13 e	2567.0	33	24.49 s	36	12.13 e	2567.0	5.2 n	4 r	1	p	n	n			
SO232	25.04.14 v	Manuel Moser	3:30	3:57 r	33	1.20 s	35	19.27 e	1370.0	33	0.09 s	35	16.75 e	1353.0	5.3 w	3 s	m	p	n	n			
SO232	25.04.14 v	Manuel Moser	3:57	4:30 r	33	0.09 s	35	16.75 e	1353.0	32	58.85 s	35	13.98 e	1353.0	5.0 w	4 s	m	m	n	n			
SO232	25.04.14 v	Manuel Moser	4:30	5:30 r	32	58.85 s	35	13.98 e	1353.0	32	56.48 s	35	9.69 e	1500.0	4.9 w	4 s	m	g	wb	n			
SO232	25.04.14 v	Manuel Moser	5:30	6:30 r	32	56.48 s	35	8.69 e	1500.0	32	54.14 s	35	3.42 e	1575.0	4.9 sw	4 c	m	g	sb	n			
SO232	25.04.14 v	Manuel Moser	6:30	7:30 r	32	54.14 s	35	3.42 e	1575.0	32	51.69 s	34	57.93 e	1441.0	5.1 sw	4 s	m	g	sb	n			
SO232	25.04.14 v	Manuel Moser	7:30	8:30 r	32	51.69 s	34	57.93 e	1441.0	32	49.23 s	34	52.45 e	1450.0	5.5 s	5 c	m	g	sb	n			
SO232	25.04.14 v	Raimund Scheuvers	8:30	9:30 r	32	49.23 s	34	52.45 e	1450.0	32	46.84 s	34	47.14 e	1375.0	5.0 s	4 c	m	g	vf	n			
SO232	25.04.14 v	Raimund Scheuvers	9:30	10:30 r	32	46.84 s	34	47.14 e	1375.0	32	44.45 s	34	41.81 e	1351.0	4.9 s	6 c	m	g	vf	n			
SO232	25.04.14 v	Raimund Scheuvers	10:30	11:07 r	32	44.45 s	34	41.81 e	1351.0	32	42.75 s	34	38.12 e	1526.0	5.4 s	5 c	m	g	vf	n			
SO232	25.04.14 v	Raimund Scheuvers	11:07	11:11 r	32	42.75 s	34	38.12 e	1526.0	32	42.61 s	34	37.86 e	1545.0	5.7 s	7 c	m	m	n	n			

Regulatory/Ship/ reference number	Date	Visual watch operator's or PAM?	Observer's / watch operator's name(s)	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source	Start position - north/ degrees longitude	Start position - south degrees latitude	Start position - east/ minutes longitude	Start position - west minutes latitude	Depth at start (metres)	End position - north/ degrees longitude	End position - south degrees latitude	End position - east/ minutes longitude	End position - west minutes latitude	Speed of water of vessel (knots)	Wind direction (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	25.04.14 v		Raimund Scheuvers	11:11	11:22 r		34	42.61 s	34	37.86 e	1545.0	32	42.15 s	34	36.64 e	1570.0	5.6 s	7 c	m	g	vf	n		
SO232	25.04.14 v		Raimund Scheuvers	11:22	11:30 n		34	42.15 s	34	36.64 e	1570.0	32	41.82 s	34	35.97 e	1577.0	5.7 s	7 c	m	g	vf	n		
SO232	25.04.14 v		Raimund Scheuvers	11:30	12:30 r		34	41.82 s	34	35.97 e	1577.0	32	39.27 s	34	30.23 e	1643.0	6.1 s	7 c	m	g	vf	n		
SO232	25.04.14 v		Jens Brack	12:30	13:30 r		34	39.27 s	34	30.23 e	1643.0	32	36.56 s	34	24.21 e	1885.0	5.7 s	7 c	m	g	vf	n		
SO232	25.04.14 v		Jens Brack	13:30	14:30 r		34	36.56 s	34	24.21 e	1885.0	32	33.91 s	34	18.37 e	2401.0	5.5 s	7 c	m	g	wf	n		
SO232	25.04.14 v		Jens Brack	14:30	15:30 r		34	33.91 s	34	18.37 e	2401.0	32	31.13 s	34	12.14 e	2587.0	5.7 s	7 c	m	g	wf	n		
SO232	25.04.14 v		Jens Brack	15:30	15:45 r		34	31.13 s	34	12.14 e	2587.0	32	30.53 s	34	10.88 e	2573.0	5.8 sw	6 c	m	n	n	n		
SO232	25.04.14 v		Jens Brack	15:45	15:45 r		34	30.53 s	34	10.88 e	2573.0	32	30.53 s	34	10.88 e	2573.0	5.9 sw	6 c	m	p	n	n		
SO232	25.04.14 v		Manuel Moser	3:30	4:30 n		33	42.75 s	33	24.65 e	3420.0	32	52.22 s	33	20.40 e	3224.0	9.3 w	5 s	m	p	n	n		
SO232	25.04.14 v		Manuel Moser	4:30	5:30 n		33	52.22 s	33	20.40 e	3224.0	33	1.68 s	33	16.18 e	3387.0	10.3 w	5 s	m	g	sb	n		
SO232	25.04.14 v		Manuel Moser	5:30	6:30 n		33	1.68 s	33	16.18 e	3387.0	33	10.77 s	33	12.20 e	3734.0	9.9 w	4 c	m	g	sb	n		
SO232	25.04.14 v		Manuel Moser	6:30	7:30 n		33	10.77 s	33	12.20 e	3734.0	33	11.46 s	33	12.00 e	3458.0	6.8 w	5 c	o	g	sb	n		
SO232	25.04.14 v		Manuel Moser	7:30	8:30 n		33	11.46 s	33	12.00 e	3458.0	33	11.93 s	33	12.05 e	3047.0	0.2 w	4 c	o	g	sb	n		
SO232	25.04.14 v		Raimund Scheuvers	8:30	9:30 n		33	11.93 s	33	12.05 e	3047.0	33	11.95 s	33	12.09 e	2890.0	0.1 w	4 c	o	g	sb	n		
SO232	25.04.14 v		Raimund Scheuvers	9:30	10:30 n		33	11.95 s	33	12.09 e	2890.0	33	11.66 s	33	12.10 e	3248.0	0.1 nw	3 s	o	g	sb	n		
SO232	25.04.14 v		Raimund Scheuvers	10:30	11:30 n		33	11.66 s	33	12.10 e	3248.0	33	6.91 s	33	22.06 e	3336.0	8.3 n	4 s	o	g	sb	n		
SO232	25.04.14 v		Raimund Scheuvers	11:30	12:30 n		33	6.91 s	33	22.06 e	3336.0	33	6.30 s	33	31.81 e	3149.0	9.2 nw	3 s	o	g	sb	n		
SO232	25.04.14 v		Jens Brack	12:30	13:34 n		33	6.30 s	33	31.91 e	3149.0	33	5.13 s	33	29.04 e	3381.0	4.7 nw	3 s	o	g	vb	n		
SO232	25.04.14 v		Jens Brack	13:34	14:30 n		33	5.13 s	33	29.04 e	3581.0	33	5.23 s	33	29.30 e	3460.0	0.4 nw	4 s	o	g	vf	n		
SO232	25.04.14 v		Jens Brack	14:30	15:30 n		33	5.23 s	33	29.30 e	3460.0	33	5.53 s	33	29.14 e	3412.0	0.9 nw	4 s	o	g	vf	n		
SO232	25.04.14 v		Jens Brack	15:30	15:45 n		33	5.53 s	33	29.14 e	3412.0	33	5.54 s	33	29.15 e	3342.0	0.0 nw	3 s	o	m	n	n		
SO232	25.04.14 v		Jens Brack	15:45	15:45 n		33	5.54 s	33	29.15 e	3342.0	33	5.54 s	33	29.15 e	3342.0	0.2 nw	3 s	o	p	n	n		
SO232	27.04.14 v		Manuel Moser	3:30	4:02 n		33	18.00 s	33	53.71 e	2899.0	33	15.47 s	33	59.71 e	2270.0	10.2 sw	6 c	o	p	n	n		
SO232	27.04.14 v		Manuel Moser	4:02	4:30 n		33	15.47 s	33	59.71 e	2270.0	33	13.37 s	34	4.52 e	2368.0	10.4 sw	5 c	o	m	n	n		
SO232	27.04.14 v		Manuel Moser	4:30	4:56 n		34	13.37 s	34	4.52 e	2368.0	33	11.40 s	34	9.22 e	2203.0	10.1 sw	4 c	o	g	n	n		
SO232	27.04.14 v		Manuel Moser	4:56	5:10 n		34	11.40 s	34	9.22 e	2203.0	33	10.28 s	34	11.88 e	2012.0	10.1 sw	5 c	o	m	wf	m		
SO232	27.04.14 v		Manuel Moser	5:10	5:30 n		34	10.28 s	34	11.88 e	2012.0	33	8.86 s	34	15.27 e	1872.0	10.0 sw	5 c	o	m	wf	n		

A.7.2 MMO efforts

Regulatory/Ship/ reference number	Date	Visual Observer's / watch operator's name(s) PAM?	Time of Source start of end of activity section of section watch (UTC)	Start position - north/ - south degrees minutes latitude	Start position - east/ - west degrees longitude	Start position - north/ - south degrees minutes latitude	Start position - east/ - west degrees longitude	Depth at start position (metres)	End position - north/ - south degrees minutes latitude	End position - east/ - west degrees longitude	Depth at end position (metres)	Speed of vessel (knots)	Wind direction force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Precipitation	Comments	Flag record
SO232	27.04.14v	Manuel Moser	5:30	33 8.86s	34 15.27e	33 6.95s	34 19.79e	1872.0	33 6.95s	34 19.79e	1872.0	10.2sw	5c	o	g	vf	n		
SO232	27.04.14v	Raimund Scheuvers	5:55	33 6.95s	34 19.79e	33 6.16s	34 25.59e	1946.0	33 6.16s	34 25.59e	1910.0	10.1sw	6c	o	g	vf	l		
SO232	27.04.14v	Raimund Scheuvers	6:05	33 6.16s	34 21.58e	33 4.41s	34 25.85e	1910.0	33 4.41s	34 25.85e	1867.0	9.9sw	6c	o	g	vf	n		
SO232	27.04.14v	Manuel Moser	6:30	33 4.41s	34 25.85e	33 3.80s	34 27.19e	1867.0	33 3.80s	34 27.19e	1848.0	10.1sw	6c	o	g	vf	n		
SO232	27.04.14v	Manuel Moser	6:36	33 3.80s	34 27.19e	33 2.79s	34 29.65e	1848.0	33 2.79s	34 29.65e	1812.0	10.2s	6c	o	m	vf	l		
SO232	27.04.14v	Manuel Moser	6:50	33 2.79s	34 29.65e	33 1.39s	34 32.96e	1812.0	33 1.39s	34 32.96e	1758.0	10.2sw	7c	o	m	vf	m		
SO232	27.04.14v	Manuel Moser	7:10	33 1.39s	34 32.96e	32 59.17s	34 38.27e	1758.0	32 59.17s	34 38.27e	1640.0	9.8sw	4c	o	g	vf	n		
SO232	27.04.14v	Manuel Moser	7:39	32 59.17s	34 38.27e	32 55.26s	34 47.30e	1640.0	32 55.26s	34 47.30e	1518.0	10.3sw	5c	o	g	vf	n		
SO232	27.04.14v	Raimund Scheuvers	8:30	32 55.26s	34 47.30e	32 51.37s	34 55.95e	1518.0	32 51.37s	34 55.95e	1576.0	10.5s	5c	o	g	vf	n		
SO232	27.04.14v	Raimund Scheuvers	9:30	32 51.37s	34 55.95e	32 51.61s	34 55.88e	1576.0	32 51.61s	34 55.88e	1389.0	1.6s	5c	o	g	vb	n		
SO232	27.04.14v	Jens Brack	10:15	32 51.61s	34 55.88e	32 51.83s	34 55.87e	1389.0	32 51.83s	34 55.87e	1351.0	0.5s	7c	o	m	n	m		
SO232	27.04.14v	Raimund Scheuvers	10:30	32 51.83s	34 55.87e	32 51.76s	34 55.95e	1351.0	32 51.76s	34 55.95e	1340.0	0.7s	6c	m	g	n	n		
SO232	27.04.14v	Raimund Scheuvers	10:50	32 51.76s	34 55.95e	32 51.77s	34 55.90e	1340.0	32 51.77s	34 55.90e	1343.0	0.2s	7c	m	g	n	l		
SO232	27.04.14v	Raimund Scheuvers	11:30	32 51.77s	34 55.91e	32 50.19s	34 59.14e	1343.0	32 50.19s	34 59.14e	1544.0	0.2s	7c	m	g	n	n		
SO232	27.04.14v	Jens Brack	12:30	32 50.19s	34 59.14e	32 50.48s	35 0.18e	1544.0	32 50.48s	35 0.18e	1518.0	8.2s	7c	m	g	n	n		
SO232	27.04.14v	Jens Brack	13:35	32 50.48s	35 0.18e	32 50.94s	35 0.15e	1518.0	32 50.94s	35 0.15e	1366.0	1.1s	7c	m	g	wb	l		
SO232	27.04.14v	Jens Brack	14:30	32 50.94s	35 0.15e	32 50.95s	35 0.16e	1366.0	32 50.95s	35 0.16e	1366.0	0.5s	7r	m	g	wb	n		
SO232	27.04.14v	Jens Brack	15:03	32 50.95s	35 0.15e	32 50.88s	35 0.19e	1366.0	32 50.88s	35 0.19e	1351.0	0.4s	6r	m	g	n	l		
SO232	27.04.14v	Jens Brack	15:30	32 50.88s	35 0.19e	32 50.81s	35 0.22e	1351.0	32 50.81s	35 0.22e	1340.0	0.3s	7c	m	m	n	n		
SO232	27.04.14v	Jens Brack	15:45	32 50.81s	35 0.22e	32 50.81s	35 0.22e	1340.0	32 50.81s	35 0.22e	1340.0	0.3s	7c	m	p	n	n		
SO232	28.04.14v	Manuel Moser	3:30	32 45.67s	35 21.53e	32 45.59s	35 21.74e	1256.0	32 45.59s	35 21.74e	1251.0	0.5s	5c	m	p	n	n		
SO232	28.04.14v	Manuel Moser	4:00	32 45.59s	35 21.74e	32 45.45s	35 21.35e	1251.0	32 45.45s	35 21.35e	1130.0	1.3s	6c	m	m	n	n		
SO232	28.04.14v	Manuel Moser	4:30	32 45.45s	35 21.35e	32 45.38s	35 21.19e	1130.0	32 45.38s	35 21.19e	1116.0	0.2s	6c	m	g	vb	n		
SO232	28.04.14v	Manuel Moser	4:53	32 45.38s	35 21.19e	32 45.35s	35 21.00e	1116.0	32 45.35s	35 21.00e	1150.0	0.2se	5c	m	g	vb	n		
SO232	28.04.14v	Manuel Moser	5:30	32 45.35s	35 21.00e	32 44.96s	35 23.71e	1150.0	32 44.96s	35 23.71e	1284.0	0.4se	4c	m	g	vb	n		
SO232	28.04.14v	Manuel Moser	6:30	32 44.96s	35 23.71e	32 41.21s	35 32.22e	1284.0	32 41.21s	35 32.22e	1504.0	9.7s	5c	m	g	vf	n		

Regulatory reference number	Ship/platform name	Date	Visual observer's / watch operator's name(s) or PAM?	Time of section start of section (UTC)	Time of section end of section (UTC)	Start position - north/degrees - minutes - south/latitude	Start position - east/degrees - minutes - west/longitude	Start position - north/degrees - minutes - south/latitude	Start position - east/degrees - minutes - west/longitude	Depth of water at start (metres)	End position - north/degrees - minutes - south/latitude	End position - east/degrees - minutes - west/longitude	End position of vessel at end (metres)	Speed of water (knots)	Wind direction (Beaufort)	Wind force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	28.04.14 v	Manuel Moser	7:30	8:30 n	32	41.21 s	35	32.22 e	1504.0	32	38.33 s	35	34.14 e	0.6 s		4 c	m	g	vb	n		
SO232	Sonne	28.04.14 v	Raimund Scheuvs	8:30	9:30 n	32	38.33 s	35	34.14 e	1690.0	32	38.76 s	35	34.67 e	6.7 s		5 c	m	g	vf	n		
SO232	Sonne	28.04.14 v	Raimund Scheuvs	9:30	10:30 n	32	38.76 s	35	34.67 e	1732.0	32	38.92 s	35	34.27 e	1.6 se		4 c	m	g	vb	n		
SO232	Sonne	28.04.14 v	Raimund Scheuvs	10:30	11:30 n	32	38.92 s	35	34.27 e	1453.0	32	38.97 s	35	35.25 e	1.2 s		4 c	m	g	vb	n		
SO232	Sonne	28.04.14 v	Raimund Scheuvs	11:30	12:30 n	32	38.97 s	35	35.25 e	1743.0	32	37.79 s	35	32.75 e	0.9 s		4 s	m	g	vb	n		
SO232	Sonne	28.04.14 v	Jens Brack	12:30	13:30 n	32	37.79 s	35	32.75 e	1640.0	32	38.16 s	35	32.35 e	0.6 s		4 s	m	g	vf	n		
SO232	Sonne	28.04.14 v	Jens Brack	13:30	14:30 n	32	38.16 s	35	32.35 e	1276.0	32	38.27 s	35	32.26 e	1.2 se		4 c	m	g	vf	n		
SO232	Sonne	28.04.14 v	Jens Brack	14:30	15:30 n	32	38.27 s	35	32.26 e	1284.0	32	35.15 s	35	34.53 e	0.4 s		3 s	o	g	vf	n		
SO232	Sonne	28.04.14 v	Jens Brack	15:30	15:43 n	32	35.15 s	35	34.53 e	1746.0	32	33.48 s	35	35.65 e	10.1 s		4 s	o	m	n	n		
SO232	Sonne	28.04.14 v	Jens Brack	15:43	15:43 n	32	33.48 s	35	35.65 e	1708.0	32	33.48 s	35	35.63 e	10.3 s		4 s	o	p	n	n		
SO232	Sonne	29.04.14 v	Manuel Moser	3:30	3:42 n	31	7.37 s	36	41.38 e	4408.0	31	7.40 s	36	41.41 e	0.9 s		2 s	o	p	n	n		
SO232	Sonne	29.04.14 v	Manuel Moser	3:42	4:30 n	31	7.40 s	36	41.41 e	4440.0	31	7.38 s	36	41.41 e	0.1 sw		2 s	o	m	n	n		
SO232	Sonne	29.04.14 v	Manuel Moser	4:30	5:30 n	31	7.38 s	36	41.41 e	4447.0	31	7.14 s	36	41.13 e	0.4 w		3 s	o	g	sb	n		
SO232	Sonne	29.04.14 v	Manuel Moser	5:30	6:30 n	31	7.14 s	36	41.13 e	4182.0	31	7.06 s	36	41.04 e	1.0 nw		3 s	o	g	sb	n		
SO232	Sonne	29.04.14 v	Manuel Moser	6:30	7:30 n	31	7.06 s	36	41.04 e	4007.0	31	7.06 s	36	41.04 e	0.2 nw		4 s	m	g	sb	n		
SO232	Sonne	29.04.14 v	Manuel Moser	7:30	8:30 n	31	7.06 s	36	41.04 e	4011.0	31	3.60 s	36	41.23 e	0.1 w		4 s	m	g	sf	n		
SO232	Sonne	29.04.14 v	Raimund Scheuvs	8:30	9:30 n	31	3.60 s	36	41.23 e	4189.0	30	54.83 s	36	44.33 e	10.1 w		5 c	m	g	vf	n		
SO232	Sonne	29.04.14 v	Raimund Scheuvs	9:30	10:30 n	30	54.83 s	36	44.33 e	4331.0	30	47.94 s	36	42.56 e	9.6 w		5 c	m	g	vf	n		
SO232	Sonne	29.04.14 v	Raimund Scheuvs	10:30	11:30 n	30	47.94 s	36	42.56 e	3612.0	30	45.98 s	36	44.32 e	9.9 w		6 c	m	g	sf	n		
SO232	Sonne	29.04.14 v	Raimund Scheuvs	11:30	12:30 n	30	45.98 s	36	44.32 e	3630.0	30	46.33 s	36	42.93 e	9.5 w		5 c	m	g	sf	n		
SO232	Sonne	29.04.14 v	Jens Brack	12:13	13:30 n	30	46.33 s	36	42.93 e	3488.0	30	46.00 s	36	42.36 e	0.2 nw		6 c	m	g	vf	n		
SO232	Sonne	29.04.14 v	Jens Brack	13:30	14:30 n	30	46.00 s	36	42.36 e	2839.0	30	46.01 s	36	42.31 e	0.1 nw		6 c	m	g	vf	n		
SO232	Sonne	29.04.14 v	Jens Brack	14:30	15:30 n	30	46.01 s	36	42.31 e	2791.0	30	46.32 s	36	42.31 e	0.1 nw		5 s	m	g	sf	n		
SO232	Sonne	29.04.14 v	Jens Brack	15:30	15:40 n	30	46.32 s	36	44.31 e	3053.0	30	46.43 s	36	42.13 e	4.1 nw		6 s	m	m	n	n		
SO232	Sonne	29.04.14 v	Jens Brack	15:40	15:40 n	30	46.43 s	36	42.13 e	2963.0	30	46.43 s	36	42.13 e	1.2 nw		5 s	m	p	n	n		
SO232	Sonne	30.04.14 v	Manuel Moser	3:30	3:43 n	30	34.14 s	37	1.46 e	4816.0	30	34.13 s	37	3.08 e	9.8 sw		6 c	m	p	n	n		
SO232	Sonne	30.04.14 v	Manuel Moser	3:43	4:30 n	30	34.13 s	37	3.08 e	4857.0	30	34.25 s	37	3.05 e	0.7 sw		6 c	m	m	n	n		

A.7.2 MMO efforts

Regulatory/Ship/ reference platform name	Date	Visual watch operator's or PAM?	Observer's / name(s)	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Start position - north/ degrees minutes latitude	Start position - east/ degrees minutes longitude	Depth at start (metres)	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	End position - north/ degrees minutes latitude	End position - east/ degrees minutes longitude	Speed of water of vessel (knots)	Wind direction (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	30.04.14 v		Manuel Moser	4:30	5:30 n	30	34.25 s	30	34.27 s	37	3.05 e	37	3.02 e	37	3.02 e	4873.0	0.7 sw	5 c	m	g	sb	n	
SO232	30.04.14 v		Manuel Moser	5:30	6:30 n	30	34.27 s	30	33.79 s	37	3.02 e	37	2.57 e	37	2.57 e	4566.0	0.6 sw	5 c	m	g	vb	n	
SO232	30.04.14 v		Manuel Moser	6:30	7:30 n	30	33.79 s	30	33.74 s	37	2.57 e	37	2.14 e	37	2.14 e	4632.0	0.7 s	5 c	m	g	sb	n	
SO232	30.04.14 v		Raimund Scheuvers	7:30	8:30 n	30	33.74 s	30	33.90 s	37	2.14 e	37	1.88 e	37	1.88 e	4723.0	0.2 sw	5 c	m	g	sb	n	
SO232	30.04.14 v		Raimund Scheuvers	8:30	9:30 n	30	33.90 s	30	33.32 s	37	1.88 e	37	53.51 e	36	53.51 e	4248.0	0.6 sw	5 c	m	g	vb	n	
SO232	30.04.14 v		Raimund Scheuvers	9:30	10:30 n	30	33.32 s	30	33.59 s	36	53.51 e	36	53.21 e	36	53.21 e	3811.0	0.3 sw	4 c	m	g	vb	n	
SO232	30.04.14 v		Raimund Scheuvers	10:30	11:30 n	30	33.58 s	30	30.94 s	36	53.21 e	36	52.87 e	36	52.87 e	3421.0	1.1 s	5 c	m	g	sb	n	
SO232	30.04.14 v		Raimund Scheuvers	11:30	12:30 n	30	33.94 s	30	33.88 s	36	52.87 e	36	52.72 e	36	52.72 e	3279.0	0.3 s	3 s	m	g	vb	n	
SO232	30.04.14 v		Jens Brack	12:30	13:30 n	30	33.88 s	30	33.83 s	36	52.72 e	36	52.78 e	36	52.78 e	3331.0	0.2 s	3 s	m	g	vf	n	
SO232	30.04.14 v		Jens Brack	13:30	14:30 n	30	33.83 s	30	39.39 s	36	52.78 e	36	44.97 e	36	44.97 e	3187.0	0.5 se	3 s	m	g	vf	n	
SO232	30.04.14 v		Jens Brack	14:30	15:23 n	30	39.39 s	30	44.96 s	36	44.97 e	36	36.86 e	36	36.86 e	2410.0	0.9 s	3 s	m	g	vf	n	
SO232	30.04.14 v		Jens Brack	15:23	15:30 n	30	44.96 s	30	45.76 s	36	36.86 e	36	35.69 e	36	35.69 e	2544.0	0.94 sw	2 s	m	m	n	n	
SO232	30.04.14 v		Jens Brack	15:30	15:30 n	30	45.76 s	30	45.76 s	36	35.69 e	36	35.69 e	36	35.69 e	2544.0	0.94 sw	4 s	m	p	n	n	
SO232	01.05.14 v		Manuel Moser	3:34	3:55 n	30	55.39 s	35	26.40 e	35	26.40 e	35	23.09 e	35	23.09 e	2377.0	9.5 ne	4 s	m	p	n	n	
SO232	01.05.14 v		Manuel Moser	3:55	4:30 n	30	56.83 s	35	23.09 e	35	23.09 e	35	19.89 e	35	19.89 e	2534.0	9.7 ne	4 s	m	m	n	n	
SO232	01.05.14 v		Manuel Moser	4:30	5:30 n	30	58.16 s	35	19.89 e	35	19.89 e	35	19.91 e	35	19.91 e	3561.0	3.0 n	6 c	m	g	wf	n	
SO232	01.05.14 v		Manuel Moser	5:30	6:30 n	30	57.70 s	35	19.91 e	35	19.91 e	35	19.92 e	35	19.92 e	2169.0	0.2 ne	6 c	m	g	wf	n	
SO232	01.05.14 v		Manuel Moser	6:30	7:30 n	30	57.38 s	35	19.92 e	35	19.92 e	35	21.21 e	35	21.21 e	2566.0	0.2 n	6 c	m	g	sf	n	
SO232	01.05.14 v		Raimund Scheuvers	7:30	8:30 n	30	58.88 s	35	21.21 e	35	21.21 e	35	24.00 e	35	24.00 e	2778.0	10.8 n	6 c	m	g	vf	n	
SO232	01.05.14 v		Raimund Scheuvers	8:30	9:30 n	31	7.96 s	31	18.13 s	35	23.99 e	35	23.99 e	35	23.99 e	2806.0	10.0 n	6 c	m	g	vf	n	
SO232	01.05.14 v		Raimund Scheuvers	9:30	10:30 n	31	18.13 s	31	27.22 s	35	23.99 e	35	24.05 e	35	24.05 e	3075.0	10.3 n	6 c	m	g	vb	n	
SO232	01.05.14 v		Raimund Scheuvers	10:30	11:30 n	31	27.22 s	31	28.00 s	35	24.05 e	35	17.64 e	35	17.64 e	3108.0	7.4 n	6 c	m	g	vf	n	
SO232	01.05.14 v		Raimund Scheuvers	11:30	12:20 n	31	28.00 s	31	27.77 s	35	17.64 e	35	17.66 e	35	17.66 e	2899.0	0.8 n	7 c	m	g	n	n	
SO232	01.05.14 v		Jens Brack	12:20	12:30 n	31	27.77 s	31	27.70 s	35	17.66 e	35	17.62 e	35	17.62 e	2964.0	0.2 n	7 c	m	m	n	m	
SO232	01.05.14 v		Jens Brack	12:30	12:34 n	31	27.70 s	31	27.61 s	35	17.62 e	35	17.65 e	35	17.65 e	2886.0	1.9 n	7 c	m	m	n	m	
SO232	01.05.14 v		Jens Brack	12:34	13:30 n	31	27.70 s	31	27.30 s	35	17.62 e	35	17.59 e	35	17.59 e	2379.0	2.5 nw	8 r	m	p	n	h	
SO232	01.05.14 v		Jens Brack	13:30	14:30 n	31	27.30 s	31	27.36 s	35	17.59 e	35	17.61 e	35	17.61 e	2404.0	0.3 w	5 c	m	m	wf	n	

Regulatory/Ship/ reference name	Date	Visual Observer's/ watch operator's (name(s) or PAM?)	Time of Time of Source Start start or end of activity position action - east/ watch - west (UTC)	Start position - degrees - north/ minutes - east/ seconds - south	Start position - degrees - north/ minutes - east/ seconds - south	Start position - degrees - north/ minutes - east/ seconds - south	Start position - degrees - north/ minutes - east/ seconds - south	Depth at water or ice level (metres)	End position - degrees - north/ minutes - east/ seconds - south	End position - degrees - north/ minutes - east/ seconds - south	End position - degrees - north/ minutes - east/ seconds - south	Depth at water or ice level (metres)	Speed (knots)	Wind direction (Beaufort)	Sea state (visual only)	Swell (visual only)	Visibility (nautical miles only)	Precipitation	Comments	Flag recon
SO232	01.05.14 v	Jens Brack	14:30	15:23 n	31	27.36 s	35	17.61 e	2404.0	31	27.16 s	35	18.79 e	5 c	m	g	v f	n		
SO232	01.05.14 v	Jens Brack	15:23	15:30 n	31	27.16 s	35	18.79 e	2651.0	31	27.14 s	35	18.76 e	6 c	m	m	n	n		
SO232	01.05.14 v	Jens Brack	15:30	15:40 n	31	27.14 s	35	18.76 e	2617.0	31	27.14 s	35	18.75 e	7 c	m	p	n	n		
SO232	01.05.14 v	Jens Brack	15:40	15:40 n	31	27.14 s	35	18.75 e	2625.0	31	27.14 s	35	18.75 e	6 c	m	p	n	n		
SO232	02.05.14 v	Manuel Moser	3:30	3:55 n	31	44.55 s	35	30.85 e	1985.0	31	44.74 s	35	30.40 e	6 c	m	p	n	n		
SO232	02.05.14 v	Manuel Moser	3:55	4:30 n	31	44.74 s	35	30.40 e	1757.0	31	44.85 s	35	30.56 e	6 c	m	m	n	n		
SO232	02.05.14 v	Manuel Moser	4:30	5:30 n	31	44.85 s	35	30.56 e	1851.0	31	45.54 s	35	30.90 e	6 c	m	g	w f	n		
SO232	02.05.14 v	Manuel Moser	5:30	6:30 n	31	45.54 s	35	30.90 e	2040.0	31	44.74 s	35	33.00 e	5 c	m	g	v f	n		
SO232	02.05.14 v	Manuel Moser	6:30	7:30 n	31	44.74 s	35	33.00 e	2435.0	31	44.74 s	35	33.00 e	6 c	m	g	s b	n		
SO232	02.05.14 v	Ramund Schreuens	7:30	8:30 n	31	44.79 s	35	32.52 e	2179.0	31	45.03 s	35	32.35 e	5 c	m	g	s b	n		
SO232	02.05.14 v	Ramund Schreuens	8:30	9:30 n	31	45.03 s	35	32.35 e	2228.0	31	45.08 s	35	28.94 e	6 c	m	g	s b	n		
SO232	02.05.14 v	Ramund Schreuens	9:30	10:30 n	31	45.94 s	35	28.94 e	1920.0	31	45.08 s	35	25.57 e	5 c	m	g	s f	n		
SO232	02.05.14 v	Ramund Schreuens	10:30	11:03 n	31	45.08 s	35	25.57 e	1916.0	31	45.18 s	35	23.50 e	6 c	m	g	s f	n		
SO232	02.05.14 v	Ramund Schreuens	11:03	11:18 s	31	45.18 s	35	23.50 e	1989.0	31	45.21 s	35	22.19 e	5 c	m	g	v f	n		
SO232	02.05.14 v	Ramund Schreuens	11:18	11:30 f	31	45.21 s	35	22.19 e	2108.0	31	45.27 s	35	21.23 e	5 c	m	g	v f	n		
SO232	02.05.14 v	Ramund Schreuens	11:30	11:41 f	31	45.27 s	35	21.23 e	2137.0	31	45.29 s	35	20.18 e	5 c	m	g	v f	n		
SO232	02.05.14 v	Ramund Schreuens	11:41	11:47 f	31	45.29 s	35	20.18 e	2125.0	31	45.29 s	35	19.64 e	4 s	m	g	v f	n		
SO232	02.05.14 v	Ramund Schreuens	11:47	12:30 f	31	45.29 s	35	19.64 e	2122.0	31	45.44 s	35	16.22 e	4 s	m	g	v f	n		
SO232	02.05.14 v	Jens Brack	12:30	13:30 f	31	45.44 s	35	16.22 e	2247.0	31	45.68 s	35	16.58 e	4 s	o	g	v f	n		
SO232	02.05.14 v	Jens Brack	13:30	13:53 f	31	45.68 s	35	10.58 e	2281.0	31	45.76 s	35	8.67 e	4 s	o	g	v f	n		
SO232	02.05.14 v	Jens Brack	13:53	13:59 n	31	45.76 s	35	8.67 e	2428.0	31	45.78 s	35	8.07 e	4 s	o	g	s f	n		
SO232	02.05.14 v	Jens Brack	13:59	14:00 f	31	45.78 s	35	8.07 e	2412.0	31	45.78 s	35	7.99 e	4 s	o	g	s f	n		
SO232	02.05.14 v	Jens Brack	14:00	14:07 n	31	45.78 s	35	7.99 e	2417.0	31	45.79 s	35	7.40 e	4 s	o	g	s f	n		
SO232	02.05.14 v	Jens Brack	14:07	14:30 f	31	45.79 s	35	7.40 e	2433.0	31	45.88 s	35	5.17 e	4 s	o	g	v f	n		
SO232	02.05.14 v	Jens Brack	14:30	15:30 f	31	45.88 s	35	5.17 e	2476.0	31	46.07 s	34	59.42 e	4 s	o	g	w f	n		
SO232	02.05.14 v	Jens Brack	15:30	15:40 f	31	46.07 s	34	59.42 e	2465.0	31	46.10 s	34	58.43 e	3 s	o	m	n	n		

A.7.2 MMO efforts

Regulatory reference number	Ship/platform name	Date	Visual observer's / watch operator's name(s) or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - degrees - north/ - south latitude	Start position - degrees - east/ - west longitude	Start position - degrees - north/ - south latitude	Start position - degrees - east/ - west longitude	Depth of water at start position (metres)	End position - degrees - north/ - south latitude	End position - degrees - east/ - west longitude	End position - degrees - north/ - south latitude	End position - degrees - east/ - west longitude	Speed of vessel (knots)	Wind direction (Beaufort)	Wind force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	02.05.14 v	Jens Brack	15:40	15:40 f	31	46.10 s	31	46.10 s	2491.0	31	46.10 s	34	58.43 e	2491.0	5.0 se	3 s	o	p	n	n			
SO232	Sonne	03.05.14 v	Manuel Moser	3:30	4:02 f	32	11.58 s	32	13.91 s	2968.0	32	13.91 s	33	55.37 e	2972.0	5.3 e	2 g	o	p	n	n			
SO232	Sonne	03.05.14 v	Manuel Moser	4:02	4:30 f	32	13.91 s	32	15.78 s	2972.0	32	15.78 s	33	53.71 e	3059.0	5.2 e	2 s	o	m	n	n			
SO232	Sonne	03.05.14 v	Manuel Moser	4:30	5:30 f	32	15.78 s	32	19.98 s	3059.0	32	19.98 s	33	49.99 e	3109.0	5.3 e	2 s	o	g	vb	n			
SO232	Sonne	03.05.14 v	Manuel Moser	5:30	6:30 f	32	19.98 s	32	23.94 s	3109.0	32	23.94 s	33	46.46 e	3117.0	5.0 e	2 s	o	g	sb	n			
SO232	Sonne	03.05.14 v	Manuel Moser	6:30	7:30 f	32	23.94 s	32	27.63 s	3117.0	32	27.63 s	33	43.15 e	3105.0	5.2 e	2 s	o	g	sb	n			
SO232	Sonne	03.05.14 v	Manuel Moser	7:30	8:30 f	32	27.63 s	32	31.12 s	3105.0	32	31.12 s	33	40.04 e	3045.0	4.5 e	2 s	o	g	sb	n			
SO232	Sonne	03.05.14 v	Raimund Scheuvers	8:30	9:30 f	32	31.12 s	32	34.55 s	3045.0	32	34.55 s	33	36.98 e	3118.0	4.3 e	2 s	o	g	vb	n			
SO232	Sonne	03.05.14 v	Raimund Scheuvers	9:30	10:30 f	32	34.55 s	32	38.00 s	3118.0	32	38.00 s	33	33.88 e	3374.0	4.2 ne	2 s	o	g	vb	n			
SO232	Sonne	03.05.14 v	Raimund Scheuvers	10:30	11:30 f	32	38.00 s	32	41.58 s	3374.0	32	41.58 s	33	30.62 e	3304.0	4.4 ne	3 s	o	g	sb	n			
SO232	Sonne	03.05.14 v	Raimund Scheuvers	11:30	12:03 f	32	41.58 s	32	44.02 s	3304.0	32	44.02 s	33	28.46 e	3412.0	4.6 ne	4 s	o	g	sb	n			
SO232	Sonne	03.05.14 v	Jens Brack	12:03	12:29 n	32	44.02 s	32	45.14 s	3412.0	32	45.14 s	33	27.34 e	3296.0	4.7 ne	4 s	o	g	sb	n			
SO232	Sonne	03.05.14 v	Jens Brack	12:29	12:49 n	32	45.14 s	32	46.50 s	3296.0	32	46.50 s	33	26.26 e	3319.0	4.8 e	4 s	o	g	vf	n			
SO232	Sonne	03.05.14 v	Jens Brack	12:50	13:04 s	32	46.50 s	32	47.47 s	3319.0	32	47.47 s	33	25.30 e	3367.0	4.8 e	4 s	o	g	vf	n			
SO232	Sonne	03.05.14 v	Jens Brack	13:04	13:30 f	32	47.47 s	32	49.31 s	3367.0	32	49.31 s	33	23.69 e	3334.0	4.8 e	4 s	o	g	vf	n			
SO232	Sonne	03.05.14 v	Jens Brack	13:30	14:30 f	32	49.31 s	32	52.94 s	3334.0	32	52.94 s	33	20.47 e	3185.0	4.8 ne	5 s	o	g	vb	n			
SO232	Sonne	03.05.14 v	Jens Brack	14:30	15:30 f	32	52.94 s	32	57.20 s	3185.0	32	57.20 s	33	16.63 e	3270.0	5.1 ne	5 s	o	g	vb	n			
SO232	Sonne	03.05.14 v	Jens Brack	15:30	15:40 f	32	57.20 s	32	57.91 s	3270.0	32	57.91 s	33	15.98 e	3292.0	5.2 ne	5 s	o	m	n	n			
SO232	Sonne	03.05.14 v	Jens Brack	15:40	15:40 f	32	57.91 s	32	57.91 s	3292.0	32	57.91 s	33	15.98 e	3292.0	5.3 ne	5 s	o	p	n	n			
SO232	Sonne	04.05.14 v	Manuel Moser	3:30	4:08 f	33	36.88 s	32	37.41 s	2899.0	33	37.41 s	32	54.29 e	2777.0	5.2 n	6 s	o	p	n	n			
SO232	Sonne	04.05.14 v	Manuel Moser	4:08	4:30 f	33	37.41 s	32	37.69 s	2777.0	33	37.69 s	32	56.47 e	2728.0	5.3 n	6 c	o	m	n	n			
SO232	Sonne	04.05.14 v	Manuel Moser	4:30	5:30 f	33	37.69 s	32	38.42 s	2728.0	33	38.42 s	33	2.80 e	2708.0	5.1 n	6 c	o	g	vf	n			
SO232	Sonne	04.05.14 v	Manuel Moser	5:30	6:30 f	33	38.42 s	32	39.22 s	2708.0	33	39.22 s	33	9.14 e	2532.0	5.5 n	6 c	o	g	sf	n			
SO232	Sonne	04.05.14 v	Manuel Moser	6:30	7:30 f	33	39.22 s	32	39.91 s	2532.0	33	39.91 s	33	14.80 e	2321.0	5.0 n	6 c	o	g	sf	n			
SO232	Sonne	04.05.14 v	Raimund Scheuvers	7:30	8:30 f	33	39.91 s	32	40.59 s	2321.0	33	40.59 s	33	20.54 e	2035.0	5.5 n	6 c	o	g	sf	n			
SO232	Sonne	04.05.14 v	Raimund Scheuvers	8:30	9:30 f	33	40.59 s	32	41.30 s	2035.0	33	41.30 s	33	26.26 e	1963.0	4.8 n	6 c	o	g	sf	n			
SO232	Sonne	04.05.14 v	Raimund Scheuvers	9:30	10:30 f	33	41.30 s	32	41.95 s	1963.0	33	41.95 s	33	31.55 e	2055.0	4.6 n	6 c	o	g	sf	n			

Regulatory reference number	Ship/platform name	Date	Visual observer's / watch operator's name(s) or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - degrees - north/ - south latitude	Start position - degrees - east/ - west longitude	Start position - minutes south latitude	Start position - minutes east/ - west longitude	Depth of water at start position (metres)	End position - degrees - north/ - south latitude	End position - minutes south latitude	End position - degrees - east/ - west longitude	End position - minutes east/ - west longitude	Speed of vessel (knots)	Wind direction (Beaufort)	Sea state (Beaufort)	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	04.05.14 v	Raimund Scheuvs	10:30	11:30 f	33	41.95 s	33	31.55 e	2055.0	33	42.55 s	33	36.48 e	2181.0	3.9 n	6 c	o	g	sb	n		
SO232	Sonne	04.05.14 v	Raimund Scheuvs	11:30	12:30 f	33	42.55 s	33	36.48 e	2181.0	33	43.15 s	33	41.67 e	2322.0	3.7 n	6 c	o	g	sb	n		
SO232	Sonne	04.05.14 v	Jens Brack	12:30	13:30 f	33	43.15 s	33	41.67 e	2322.0	33	43.67 s	33	46.66 e	2419.0	4.4 n	6 c	o	g	vb	n		
SO232	Sonne	04.05.14 v	Jens Brack	13:30	14:30 f	33	43.67 s	33	46.66 e	2419.0	33	44.46 s	33	52.00 e	2721.0	4.7 n	6 c	o	g	sb	n		
SO232	Sonne	04.05.14 v	Jens Brack	14:30	15:20 f	33	44.46 s	33	52.00 e	2721.0	33	45.04 s	33	56.86 e	2677.0	4.4 n	6 c	o	g	vb	n		
SO232	Sonne	04.05.14 v	Jens Brack	15:20	15:30 f	33	45.04 s	33	56.86 e	2677.0	33	45.14 s	33	57.82 e	2650.0	4.4 n	5 s	o	m	n	n		
SO232	Sonne	04.05.14 v	Jens Brack	15:30	15:40 f	33	45.14 s	33	57.82 e	2650.0	33	45.25 s	33	58.60 e	2633.0	4.7 n	5 s	o	p	n	n		
SO232	Sonne	04.05.14 v	Jens Brack	15:40	15:40 f	33	45.25 s	33	58.60 e	2633.0	33	45.25 s	33	58.60 e	2633.0	5.1 n	5 s	o	p	n	n		
SO232	Sonne	05.05.14 v	Manuel Moser	3:30	4:06 f	33	53.72 s	34	52.40 e	2109.0	33	56.05 s	34	52.09 e	2370.0	3.9 nw	3 s	o	p	n	n		
SO232	Sonne	05.05.14 v	Manuel Moser	4:06	4:30 f	33	56.05 s	34	52.09 e	2370.0	33	57.54 s	34	51.81 e	2484.0	3.5 n	4 s	o	m	n	n		
SO232	Sonne	05.05.14 v	Manuel Moser	4:30	5:30 f	33	57.54 s	34	51.81 e	2484.0	34	1.85 s	34	51.21 e	2518.0	4.4 nw	4 s	o	g	vb	n		
SO232	Sonne	05.05.14 v	Manuel Moser	5:30	6:24 f	34	1.85 s	34	51.21 e	2518.0	34	5.65 s	34	50.66 e	2574.0	4.2 n	4 s	o	g	sb	n		
SO232	Sonne	05.05.14 v	Manuel Moser	6:24	7:03 f	34	5.65 s	34	50.66 e	2574.0	34	7.84 s	34	50.31 e	2614.0	3.5 n	4 s	o	g	sb	n		
SO232	Sonne	05.05.14 v	Manuel Moser	7:03	7:20 f	34	7.84 s	34	50.31 e	2614.0	34	8.63 s	34	50.16 e	2611.0	3.3 nw	4 s	o	m	wb	l		
SO232	Sonne	05.05.14 v	Manuel Moser	7:20	7:30 f	34	8.63 s	34	50.16 e	2611.0	34	9.34 s	34	50.10 e	2654.0	3.1 sw	6 c	o	p	n	h		
SO232	Sonne	05.05.14 v	Manuel Moser	7:30	7:43 f	34	9.34 s	34	50.10 e	2654.0	34	10.22 s	34	49.97 e	2591.0	3.8 sw	5 c	o	p	n	m		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	7:43	8:01 f	34	10.22 s	34	49.97 e	2591.0	34	10.22 s	34	49.82 e	2574.0	3.5 sw	7 c	o	m	n	l		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	8:01	8:08 f	34	11.23 s	34	49.82 e	2574.0	34	11.59 s	34	49.75 e	2568.0	3.2 sw	7 c	o	m	n	n		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	8:08	8:30 f	34	11.59 s	34	49.75 e	2568.0	34	12.95 s	34	49.54 e	2553.0	3.7 sw	7 c	o	m	n	l		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	8:30	8:45 f	34	12.95 s	34	49.54 e	2553.0	34	13.94 s	34	49.42 e	2542.0	3.9 sw	7 c	o	m	n	l		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	8:45	9:30 f	34	13.94 s	34	49.42 e	2542.0	34	17.12 s	34	48.94 e	2510.0	4.4 sw	7 c	m	g	n	n		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	9:30	10:30 f	34	17.12 s	34	48.94 e	2510.0	34	20.66 s	34	48.44 e	2528.0	4.1 sw	7 c	m	g	n	n		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	10:30	11:30 f	34	20.66 s	34	48.44 e	2528.0	34	23.82 s	34	47.93 e	2573.0	3.4 sw	7 c	m	g	vb	n		
SO232	Sonne	05.05.14 v	Raimund Scheuvs	11:30	12:30 f	34	23.82 s	34	47.93 e	2573.0	34	27.54 s	34	47.37 e	2623.0	3.3 sw	8 r	l	g	sb	n		
SO232	Sonne	05.05.14 v	Jens Brack	12:30	13:30 f	34	27.54 s	34	47.37 e	2623.0	34	31.04 s	34	46.89 e	2666.0	3.5 sw	8 r	l	g	vb	n		
SO232	Sonne	05.05.14 v	Jens Brack	13:30	14:30 f	34	31.04 s	34	46.89 e	2666.0	34	35.07 s	34	46.24 e	2698.0	3.5 sw	7 r	l	g	vb	n		
SO232	Sonne	05.05.14 v	Jens Brack	14:30	15:20 f	34	35.07 s	34	46.24 e	2698.0	34	35.90 s	34	48.71 e	2703.0	4.6 sw	6 r	l	g	vb	n		

A.7.2 MMO efforts

Regulatory reference number	Ship/platform name	Date	Visual Observer's / watch operator's name(s) or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Start position - degrees latitude	Start position - minutes south	Start position - degrees longitude	Start position - minutes west	Depth of water at start position (metres)	End position - degrees latitude	End position - minutes south	End position - degrees longitude	End position - minutes west	Depth of water at end position (metres)	Speed of vessel (knots)	Wind direction	Wind force (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	Sonne	05.05.14 v	Jens Brack	15:20	15:30 f	34	35.90 s	34	48.71 e	2703.0	34	35.63 s	34	49.54 e	2700.0	4.8 s			6 r	m	n	n			
SO232	Sonne	05.05.14 v	Jens Brack	15:30	15:35 f	34	35.63 s	34	49.54 e	2700.0	34	35.41 s	34	49.96 e	2694.0	4.7 s			5 c	m	p	n			
SO232	Sonne	05.05.14 v	Jens Brack	15:35	15:35 f	34	35.41 s	34	49.96 e	2694.0	34	35.41 s	34	49.96 e	2694.0	5.3 s			5 c	m	p	n			
SO232	Sonne	06.05.14 v	Manuel Moser	3:30	4:15 f	34	34.46 s	33	35.09 e	2385.0	34	34.55 s	33	30.67 e	2326.0	5.1 se			6 c	m	p	n			
SO232	Sonne	06.05.14 v	Manuel Moser	4:15	4:30 f	34	34.55 s	33	30.67 e	2326.0	34	34.53 s	33	29.44 e	2343.0	4.7 se			5 c	m	m	n			
SO232	Sonne	06.05.14 v	Manuel Moser	4:30	5:30 f	34	34.53 s	33	29.44 e	2343.0	34	34.57 s	33	24.10 e	2318.0	4.2 se			4 c	m	m	n			
SO232	Sonne	06.05.14 v	Manuel Moser	5:30	5:56 f	34	34.57 s	33	24.10 e	2318.0	34	34.59 s	33	21.58 e	2277.0	4.7 se			5 c	m	g	n			
SO232	Sonne	06.05.14 v	Raimund Scheuvs	5:56	6:05 n	34	34.59 s	33	21.58 e	2277.0	34	34.60 s	33	20.76 e	2284.0	4.6 se			5 c	m	g	n			
SO232	Sonne	06.05.14 v	Raimund Scheuvs	6:05	6:08 s	34	34.60 s	33	20.76 e	2284.0	34	34.60 s	33	20.54 e	2290.0	4.5 se			5 c	m	g	n			
SO232	Sonne	06.05.14 v	Raimund Scheuvs	6:08	6:30 f	34	34.60 s	33	20.54 e	2290.0	34	34.60 s	33	18.30 e	2365.0	4.8 se			5 c	m	g	n			
SO232	Sonne	06.05.14 v	Manuel Moser	6:30	7:30 f	34	34.60 s	33	18.30 e	2365.0	34	34.65 s	33	12.46 e	2383.0	4.9 se			5 c	m	g	n			
SO232	Sonne	06.05.14 v	Manuel Moser	7:30	8:30 f	34	34.65 s	33	12.46 e	2383.0	34	34.69 s	33	6.01 e	2437.0	5.0 se			3 c	m	g	n			
SO232	Sonne	06.05.14 v	Raimund Scheuvs	8:30	9:30 f	34	34.69 s	33	6.01 e	2437.0	34	34.74 s	32	59.57 e	2420.0	5.1 e			4 s	m	g	n			
SO232	Sonne	06.05.14 v	Raimund Scheuvs	9:30	10:30 f	34	34.74 s	32	59.57 e	2420.0	34	34.75 s	32	53.25 e	2271.0	5.4 e			3 s	m	g	vf			
SO232	Sonne	06.05.14 v	Raimund Scheuvs	10:30	11:30 f	34	34.75 s	32	53.25 e	2271.0	34	34.81 s	32	46.94 e	2144.0	5.3 se			4 s	m	g	vf			
SO232	Sonne	06.05.14 v	Raimund Scheuvs	11:30	12:30 f	34	34.81 s	32	46.94 e	2144.0	34	34.84 s	32	40.58 e	2292.0	5.0 e			4 s	l	g	vf			
SO232	Sonne	06.05.14 v	Jens Brack	12:30	13:30 f	34	34.84 s	32	40.58 e	2292.0	34	34.90 s	32	34.16 e	2452.0	5.1 e			4 s	o	g	vf			
SO232	Sonne	06.05.14 v	Jens Brack	13:30	14:30 f	34	34.90 s	32	34.16 e	2452.0	34	34.93 s	32	28.42 e	2763.0	5.1 e			4 s	o	g	vf			
SO232	Sonne	06.05.14 v	Jens Brack	14:30	15:20 f	34	34.93 s	32	28.42 e	2763.0	34	34.94 s	32	22.85 e	2860.0	5.2 e			4 s	o	g	vf			
SO232	Sonne	06.05.14 v	Jens Brack	15:20	15:30 f	34	34.94 s	32	22.85 e	2860.0	34	34.95 s	32	21.99 e	2862.0	5.2 ne			4 s	m	m	n			
SO232	Sonne	06.05.14 v	Jens Brack	15:30	15:30 f	34	34.95 s	32	21.99 e	2862.0	34	34.95 s	32	21.99 e	2862.0	5.0 ne			4 s	m	p	n			
SO232	Sonne	07.05.14 v	Manuel Moser	3:03	4:20 n	34	57.97 s	30	45.27 e	4463.0	35	0.71 s	30	35.45 e	4444.0	9.9 ne			6 c	o	p	n			
SO232	Sonne	07.05.14 v	Manuel Moser	4:20	4:30 n	35	0.71 s	30	35.45 e	4444.0	35	1.21 s	30	33.79 e	4441.0	9.9 ne			6 c	m	m	n			
SO232	Sonne	07.05.14 v	Manuel Moser	4:30	5:30 n	35	1.21 s	30	33.79 e	4441.0	35	4.47 s	30	22.38 e	4466.0	10.0 ne			6 c	m	m	n			
SO232	Sonne	07.05.14 v	Manuel Moser	5:30	6:30 n	35	4.47 s	30	22.38 e	4466.0	35	7.68 s	30	10.81 e	4489.0	10.1 ne			6 c	m	g	vb			
SO232	Sonne	07.05.14 v	Manuel Moser	6:30	7:30 n	35	7.68 s	30	10.81 e	4489.0	35	11.02 s	29	59.10 e	4490.0	10.0 ne			7 c	m	g	vb			
SO232	Sonne	07.05.14 v	Manuel Moser	7:30	8:30 n	35	11.02 s	29	59.10 e	4490.0	35	14.26 s	29	47.68 e	4483.0	10.3 ne			7 r	m	g	vb			

Regulatory/Ship/ reference number	Date	Visual observer's/ watch operator's name(s) PAM?	Time of start of section watch (UTC)	Time of end of activity watch (UTC)	Source	Start	Start	Start	Start	Depth at water position (metres)	End	End	End	End	Depth at water position (metres)	Speed (knots)	Wind direction (degrees)	Wind force (Beaufort)	Sea state (visual only)	Swell visibility (visual only)	Precipitation	Comments	Flag recor
						position - north degrees minutes seconds latitude	position - north degrees minutes seconds latitude	position - north degrees minutes seconds latitude	position - north degrees minutes seconds latitude		position - east/ west longitude	position - east/ west longitude	position - east/ west longitude	position - east/ west longitude									
SO232	07.05.14 v	Raimund Schewens	8:30	9:30 n	35	14.26 s	29	47.68 e	4483.0	35	17.60 s	29	35.94 e	4470.0	9.9 ne	7 r	m	g	vb	n			
SO232	07.05.14 v	Raimund Schewens	9:30	10:30 n	35	17.60 s	29	35.94 e	4470.0	35	20.93 s	29	24.12 e	4444.0	10.2 ne	7 c	m	g	vb	n			
SO232	07.05.14 v	Raimund Schewens	10:30	11:30 n	35	20.93 s	29	24.12 e	4444.0	35	24.32 s	29	12.40 e	4392.0	10.6 ne	7 c	m	g	vb	n			
SO232	07.05.14 v	Raimund Schewens	11:30	12:30 n	35	24.32 s	29	12.40 e	4392.0	35	27.55 s	29	0.79 e	4436.0	10.1 ne	7 c	m	g	n	n			
SO232	07.05.14 v	Jens Brack	12:30	13:30 n	35	27.55 s	29	0.79 e	4436.0	35	30.90 s	28	48.79 e	4506.0	10.1 ne	7 c	m	g	n	n			
SO232	07.05.14 v	Jens Brack	13:30	14:30 n	35	30.90 s	28	48.79 e	4506.0	35	34.21 s	28	37.22 e	4542.0	9.9 ne	8 c	m	g	vf	n			
SO232	07.05.14 v	Jens Brack	14:30	15:30 n	35	34.21 s	28	37.22 e	4542.0	35	37.35 s	28	25.98 e	4560.0	10.2 n	7 c	m	m	n	n			
SO232	07.05.14 v	Jens Brack	15:30	16:03 n	35	37.35 s	28	25.98 e	4560.0	35	39.33 s	28	18.91 e	4566.0	10.2 n	7 r	m	m	n	n			
SO232	07.05.14 v	Manuel Moser	16:03	16:03 n	35	39.33 s	28	18.91 e	4566.0	35	39.33 s	28	18.91 e	4566.0	9.9 n	7 r	m	p	n	n			
SO232	08.05.14 v	Manuel Moser	3:30	4:30 n	36	17.11 s	26	4.21 e	4699.0	36	22.80 s	25	54.25 e	4487.0	9.9 n	4 c	m	p	n	n			
SO232	08.05.14 v	Manuel Moser	4:30	5:30 n	36	22.80 s	25	54.25 e	4487.0	36	28.67 s	25	46.00 e	3731.0	10.1 n	3 s	o	m	n	n			
SO232	08.05.14 v	Manuel Moser	5:30	6:30 n	36	28.67 s	25	46.00 e	3731.0	36	34.87 s	25	37.29 e	3410.0	9.5 n	4 c	m	g	sb	n			
SO232	08.05.14 v	Manuel Moser	6:30	7:30 n	36	34.87 s	25	37.29 e	3410.0	36	42.36 s	25	26.75 e	3974.0	10.0 n	4 s	o	g	wb	n			
SO232	08.05.14 v	Raimund Schewens	7:30	8:30 n	36	42.36 s	25	26.75 e	3974.0	36	49.00 s	25	17.35 e	2977.0	9.7 n	3 s	o	g	sb	n			
SO232	08.05.14 v	Raimund Schewens	8:30	9:30 n	36	49.00 s	25	17.35 e	2977.0	36	55.59 s	25	8.11 e	3909.0	10.1 n	4 s	o	g	sb	n			
SO232	08.05.14 v	Raimund Schewens	9:30	10:30 n	36	55.59 s	25	8.11 e	3909.0	37	2.02 s	24	59.08 e	3439.0	9.9 n	4 s	o	g	sb	n			
SO232	08.05.14 v	Raimund Schewens	10:30	11:30 n	37	2.02 s	24	59.08 e	3439.0	37	8.32 s	24	50.13 e	3488.0	9.8 n	4 s	o	g	sb	n			
SO232	08.05.14 v	Raimund Schewens	11:30	11:40 n	37	8.32 s	24	50.13 e	3488.0	37	9.57 s	24	48.34 e	3749.0	9.4 nw	3 s	o	g	vb	n			
SO232	08.05.14 v	Jens Brack	12:04	12:04 n	37	9.57 s	24	48.34 e	3749.0	37	12.04 s	24	44.27 e	3622.0	10.0 nw	3 s	o	m	vb	n			
SO232	08.05.14 v	Jens Brack	12:04	12:14 n	37	12.04 s	24	44.27 e	3622.0	37	12.91 s	24	42.82 e	3702.0	10.2 nw	3 s	o	g	wb	n			
SO232	08.05.14 v	Jens Brack	12:14	12:30 n	37	12.91 s	24	42.82 e	3702.0	37	14.32 s	24	40.46 e	3818.0	10.4 nw	3 s	o	g	vb	l			
SO232	08.05.14 v	Jens Brack	12:30	12:59 n	37	14.32 s	24	40.46 e	3818.0	37	17.40 s	24	35.17 e	4158.0	9.9 w	3 s	o	g	vb	n			
SO232	08.05.14 v	Jens Brack	12:59	13:30 n	37	17.40 s	24	35.17 e	4158.0	37	19.98 s	24	31.73 e	4467.0	9.8 w	4 s	o	g	wb	l			
SO232	08.05.14 v	Jens Brack	13:30	14:30 n	37	19.98 s	24	31.73 e	4467.0	37	20.13 s	24	39.48 e	3933.0	0.2 w	4 s	o	g	vb	n			
SO232	08.05.14 v	Jens Brack	14:30	15:30 n	37	20.13 s	24	39.48 e	3933.0	37	20.35 s	24	41.33 e	3877.0	1.3 sw	3 s	o	g	sb	n			
SO232	08.05.14 v	Jens Brack	15:30	15:31 n	37	20.35 s	24	41.33 e	3877.0	37	20.37 s	24	41.45 e	3881.0	1.6 sw	3 s	o	m	n	n			

A.7.2 MMO efforts

Regulatory/Ship/ reference platform name	Date	Visual Observer's / watch operator's or PAM?	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source activity	Start position - north/ - south degrees minutes latitude	Start position - north/ - south degrees minutes latitude	Start position - east/ - west degrees minutes longitude	Start position - east/ - west degrees minutes longitude	Depth of water at start (metres)	End position - north/ - south degrees minutes latitude	End position - east/ - west degrees minutes longitude	End position - east/ - west degrees minutes longitude	Depth of water at end (metres)	Speed of vessel (knots)	Wind direction (Beaufort)	Sea state	Swell (visual watch only)	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments	Flag record
SO232	08.05.14 v	Jens Brack	15:31	16:04 n		37	20.37 s	24	41.45 e	3881.0	37	20.53 s	24	42.82 e	3888.0	1.6 sw	3 s	o	m	n	l		
SO232	08.05.14 v	Jens Brack	16:04	16:04 n		37	20.53 s	24	42.82 e	3888.0	37	20.53 s	24	42.82 e	3888.0	2.4 sw	3 s	o	p	n	n		
SO232	08.05.14 v	Manuel Moser	3:40	4:30 n		37	11.17 s	25	13.30 e	3411.0	37	11.75 s	25	11.21 e	3350.0	2.1 w	7 r	m	p	n	n		
SO232	08.05.14 v	Manuel Moser	4:30	5:22 n		37	11.75 s	25	11.21 e	3350.0	37	13.02 s	25	9.22 e	3412.0	2.4 w	7 r	m	m	n	n		
SO232	08.05.14 v	Manuel Moser	5:22	5:30 n		37	13.02 s	25	9.22 e	3412.0	37	13.27 s	25	8.89 e	3383.0	2.7 w	7 r	m	p	wb	m		
SO232	08.05.14 v	Manuel Moser	5:30	6:13 n		37	13.27 s	25	8.89 e	3383.0	37	14.48 s	25	7.12 e	3460.0	2.5 w	7 r	m	m	n	l		
SO232	08.05.14 v	Manuel Moser	6:13	6:30 n		37	14.48 s	25	7.12 e	3460.0	37	14.87 s	25	6.45 e	3483.0	2.7 w	7 r	m	p	n	h		
SO232	08.05.14 v	Manuel Moser	6:30	7:03 n		37	14.87 s	25	6.45 e	3483.0	37	14.90 s	25	5.50 e	3398.0	2.7 w	5 c	m	p	n	m		
SO232	08.05.14 v	Manuel Moser	7:03	7:06 n		37	14.90 s	25	5.50 e	3398.0	37	14.61 s	25	5.64 e	3407.0	7.4 w	6 c	m	p	n	h		
SO232	08.05.14 v	Manuel Moser	7:06	7:30 n		37	14.61 s	25	5.64 e	3407.0	37	11.54 s	25	9.32 e	3293.0	9.3 w	6 c	m	m	n	l		
SO232	08.05.14 v	Manuel Moser	7:30	8:05 n		37	11.54 s	25	9.32 e	3293.0	37	7.45 s	25	14.81 e	3203.0	10.2 w	6 c	m	g	n	n		
SO232	08.05.14 v	Raimund Scheuvers	8:05	8:30 n		37	7.45 s	25	14.81 e	3203.0	37	4.96 s	25	17.02 e	3554.0	10.2 n	4 c	m	m	n	l		
SO232	08.05.14 v	Raimund Scheuvers	8:30	9:08 n		37	7.96 s	25	17.02 e	3554.0	37	2.82 s	25	14.23 e	3343.0	5.4 nw	7 c	m	g	n	l		
SO232	08.05.14 v	Raimund Scheuvers	9:08	9:13 n		37	2.82 s	25	14.23 e	3343.0	37	2.81 s	25	13.93 e	3318.0	3.8 nw	9 r	m	p	n	h		
SO232	08.05.14 v	Raimund Scheuvers	9:13	9:30 n		37	1.81 s	25	13.93 e	3318.0	37	3.25 s	25	12.26 e	2973.0	4.7 nw	6 c	m	g	n	n		
SO232	08.05.14 v	Raimund Scheuvers	9:30	10:30 n		37	3.25 s	25	12.26 e	2973.0	37	2.79 s	25	15.05 e	3619.0	6.3 w	7 c	m	g	n	n		
SO232	08.05.14 v	Raimund Scheuvers	10:30	11:30 n		37	2.79 s	25	15.05 e	3619.0	37	2.74 s	25	14.79 e	3619.0	0.5 w	8 r	m	g	n	l		
SO232	08.05.14 v	Raimund Scheuvers	11:30	11:55 n		37	2.74 s	25	14.79 e	3542.0	37	2.72 s	25	14.31 e	3246.0	0.2 nw	7 r	m	g	vf	n		
SO232	08.05.14 v	Jens Brack	11:55	12:30 n		37	2.72 s	25	14.31 e	3246.0	37	2.70 s	25	14.19 e	3310.0	0.6 w	8 r	m	p	n	h		
SO232	08.05.14 v	Jens Brack	12:30	13:30 n		37	2.70 s	25	14.19 e	3310.0	37	2.71 s	25	14.22 e	3266.0	0.2 nw	6 c	m	g	n	n		
SO232	08.05.14 v	Jens Brack	13:30	14:30 n		37	2.71 s	25	14.22 e	3266.0	37	2.34 s	25	12.36 e	3297.0	0.3 nw	8 r	m	g	vf	n		
SO232	08.05.14 v	Jens Brack	14:30	15:30 n		37	2.34 s	25	12.36 e	3297.0	37	1.08 s	25	7.07 e	3342.0	4.7 nw	8 r	m	g	vf	n		
SO232	08.05.14 v	Jens Brack	15:30	16:03 n		37	1.08 s	25	7.07 e	3342.0	37	0.36 s	25	4.00 e	3649.0	4.1 nw	8 r	m	m	n	n		
SO232	08.05.14 v	Manuel Moser	16:03	16:03 n		37	0.36 s	25	4.00 e	3649.0	37	0.36 s	25	4.00 e	3649.0	4.9 w	8 r	m	p	n	n		

A.7.3 MMO operations

Regulatory reference number	Ship/platform name	Date	Reason for firing	Time soft ramp-up began (UTC)	Time of full power (UTC)	Time of start of line (UTC)	Time of end of line (UTC) (if relevant)	Time of reduced output (UTC) (if stopped)	Time of airguns/ source stopped (UTC)	Time of preshooting search began (UTC)	Time of search ended (UTC)	Time of PAM began (UTC)	Time of PAM ended (UTC)	Depth range	Was it day or night in the period prior to firing?	Was any mitigating action required?	Comments	Flag record
SO232	Sonne	02.04.14	x	7:18	7:33	7:33	1:59				16:32							
SO232	Sonne	03.04.14	l			2:27	10:33		3:45	3:30	16:30			d	d	n	continuous MMO watch during the complete cruise at daylight (ca. 3:30 - 16:00 UTC), no sight at night, end of line: 03/04/14	
SO232	Sonne	03.04.14	l	5:45	6:00	2:27	10:33		10:33	3:30	16:30			d	d	n	end of line: 04/04/14	
SO232	Sonne	04.04.14	l	11:26	11:41	12:07	19:32		19:32	3:30	16:30			d	d	n	end of line: 05/04/14	
SO232	Sonne	05.04.14	l	19:54	20:09	20:09	14:52		10:54	3:30	16:30			d	n	n	end of line: 06/04/14	
SO232	Sonne	06.04.14	l	11:30	11:45	20:09	14:52		14:52	3:30	16:30			d	d	n	start of line: 05/04/14	
SO232	Sonne	10.04.14	l	18:50	19:05	19:05	0:36		0:36	3:30	16:30			d	n	n	end of line: 11/04/14	
SO232	Sonne	11.04.14	l	1:32	1:47	1:51	20:50		20:50	3:30	16:30			d	n	n		
SO232	Sonne	11.04.14	l	21:32	21:47	21:52	16:54		16:54	3:30	16:30			d	n	n	end of line: 12/04/14	
SO232	Sonne	12.04.14	l	17:34	17:49	17:58	13:51		13:51	3:30	16:30			d	n	n	end of line: 13/04/14	
SO232	Sonne	13.04.14	l	14:55	15:10	15:10	2:14		2:14	3:30	16:30			d	d	n	end of line: 14/04/14	
SO232	Sonne	14.04.14	l	3:18	3:33	3:33	16:13	11:41	16:13	3:30	16:30			d	n	n		
SO232	Sonne	14.04.14	l	17:04		17:25	19:03	17:14	19:03	3:30	16:30			d	d	n	end of line: 16/04/14	
SO232	Sonne	20.04.14	l	23:54	0:09	0:09	1:48		1:48	3:30	15:47			d	n	n	end of line: 22/04/14	
SO232	Sonne	22.04.14	l	3:19	3:34	3:34	12:37			3:31	15:47			d	n	n		

A.7.3 MMO operations

Regulatory reference number	Ship/ platform name	Date	Reason for firing	Time soft start/ ramp-up began (UTC)	Time of full power (UTC)	Time of start of line (UTC)	Time of end of line (UTC)	Time of reduced output (UTC) (if relevant)	Time of airguns/ source stopped (UTC)	Time preshooting search began (UTC)	Time search ended (UTC)	Time PAM began (UTC)	Time PAM ended (UTC)	Depth range	Was it day or night in the period prior to firing?	Was any mitigating action required?	Comments	Flag record
SO232	Sonne	22.04.14	I			12:37	1:31		1:31	3:31	15:47			d	d	n	end of line: 23/04/14	
SO232	Sonne	23.04.14	I	2:13	2:28	2:28	17:35			3:31	15:45			d	n	n		
SO232	Sonne	23.04.14	I			17:35	15:51	13:03	15:51	3:31	15:45			d	n	n	end of line: 24/04/14	
SO232	Sonne	24.04.14	I	16:41		17:07	21:49	16:51	11:21	3:30	15:45			d	n	n	end of line: 25/04/14	
SO232	Sonne	25.04.14	I			17:07	21:49	11:30	21:49	3:30	15:45			d	d	n	start of line: 24/04/14	
SO232	Sonne	02.05.14	I	11:03	11:18	11:18	21:30	11:41		3:30	15:40			d	d	n		
SO232	Sonne	02.05.14	I		11:47	11:18	21:30		13:53	3:30	15:40			d	d	n		
SO232	Sonne	02.05.14	I		13:59	11:18	21:30		14:00	3:30	15:40			d	d	n		
SO232	Sonne	02.05.14	I		14:07	11:18	21:30		21:30	3:30	15:40			d	d	n		
SO232	Sonne	02.05.14	I	21:57	22:12	22:12	0:50		12:05	3:30	15:40			d	n	y	end of line: 04/05/14	
SO232	Sonne	03.05.14	I	12:49	13:04	22:12	0:50										start of line: 02/05/14 , end of line: 04/05/14	
SO232	Sonne	04.05.14	I	1:48	2:03	2:03	1:28		1:28	3:30	15:40			d	n	n	end of line: 05/05/14	
SO232	Sonne	05.05.14	I	2:41	2:56	3:01	14:43		14:43	3:30	15:35			d	n	n		
SO232	Sonne	05.05.14	I	16:11	16:26	16:23	18:39		5:56	3:30	15:35			d	n	n	end of line: 06/05/14	
SO232	Sonne	06.05.14	I	6:05	6:07	16:23	18:39		18:39	3:30	15:30			d	d	n	start of line: 05/05/14	
SO232	Sonne	08.05.14	I	17:27	17:42	17:42	22:29		22:29	3:30	16:04			d	n	n		
SO232	Sonne	08.05.14	I	23:50	0:05	23:50	3:09		3:09	3:30	16:04			d	n	n	end of line: 09/05/14	

A.7.4 MMO sightings

[illegible]



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